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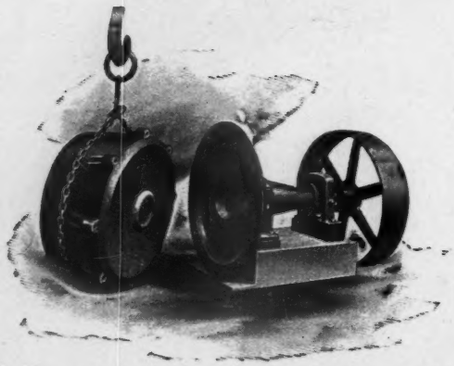

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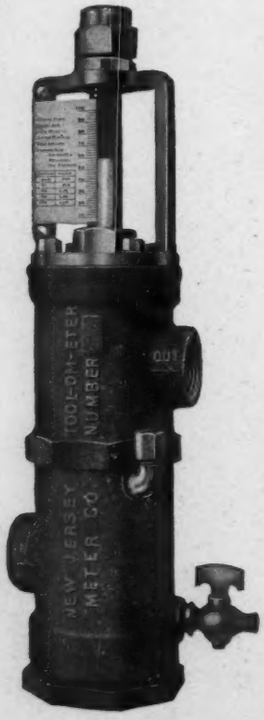

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Minnesota—The World's Greatest Iron Producing Country

By FRANCIS JUDSON TIETSORT

MINNESOTA is a large, airy, out-of-doors sort of place with an invigorating atmosphere which sometimes drops to 50 degrees below zero. The commonwealth is filled with and likewise comprises iron, timber, water, education and alfalfa and other things furnished by a bountifully provident Nature. There is enough of a summer in which to grow things to feed one in winter. During the warm solstice, too, one may cut timber for a house and firewood to keep it comfortable during the arctic season.

The water is found in Lake Superior and some 10,000 inland lakes throughout the state. Timber is so plentiful that when a few thousand acres catch fire, nobody gets vastly excited, though they deplore the loss of natural wealth. Everyone keeps cool under such circumstances by merely jumping into one of the 10,001 lakes.

The iron lays about in fixed convenient areas, on the surface mostly, and is to be had for the shovelling.

Alfalfa and other varieties of hay bring rich returns to the farmers, among whom are many Finns. In the adjacent lakes are many other varieties of fins.

Education is largely a bi-product of iron. The iron mining companies pay such big taxes to the local communities in which they are located that towns of one thousand inhabitants often have plants for learning, elementary and advanced, that would make the Rockefeller Foundation blush for its extravagance had it fathered them. There are small cities in which the municipally owned buildings, such as schools, libraries and town halls are worth more than all the rest of the real estate in the town put together! Here the local authorities appear to have borrowed a leaf from Tammany's book. But the mine country Minnesotan likes to look at these monuments to civic progress and grins while he demands philosophically: "Well, if we can get away with it, why not? Isn't learning a good thing?"

Our especial interest when we arrived at Duluth, the water portal to Minnesota, was in the iron mines; and after a day or two of inspection of the ore-handling facilities at Duluth-Superior and an afternoon at the wonderful plant of the Minnesota Steel Company, we were taken gently but firmly in hand by Mr. Stacy H. Hill, manager of the Duluth office of the Ingersoll-Rand Company and motored forth on a 400-mile trip into the heart of the iron region.

Mr. Hill is an expert on iron mining, incidental equipment for it and on the men who do the iron mining. He knows the Mesaba and Vermilion ranges backward and forward, sidewise and underground, and personally knows almost every man jack and Cousin Jack in the entire region by his first name. He is tall and well built and has unbelievable powers of endurance which tested every fibre of the writer's being during his whirlwind grand tour in Mr. Hill's enlivening company. He is the only equipment salesman I have ever encountered who had some of his best customers so largely in his confidence that the responsibility for ordering new machinery was up to him and not them. Some of his customers never know anything about the machinery he has ordered for them until they O. K. the bills!

For a week he acted as our cicerone, chauffeur and friend on a trip that will always remain in memory as one of the most pleasant and informative journalistic experiences we have ever had. As a travelling companion we had with us on much of the trip the assistant chief engineer of one of the biggest iron mining companies, who provided a fund of anecdote and experience in the region that formed an invaluable base or background for the impressions we received.

Our itinerary took us out over the Miller Trunk Road through the hamlet of Cotton and past thousands of acres of burnt cut-over land devastated by the great forest fire of 1917. In that peculiar conflagration of the woods balls of gas and fire leaped miles unaccountably, spreading the fierce onrush of flames from many new points. More than a thousand folk perished in that mysterious disaster and millions in property went up in smoke. One family moved its household effects to the centre of a large bare field, thinking it certain their home would burn. The only thing burned on that farm, to speak of, was the household furniture taken to the centre of that field.

"I move that Congress be made to pass a resolution prohibiting forest fires." This was proposed by one nature-loving American citizen to the Forestry Commission.

"A strip one and one-half miles in width shall be cleared around each village and town, and this strip shall be kept in such condition that no inflammable growth whatsoever shall appear." This from another nature lover to the Forestry Commission as a means of forest fire prevention. Someone figured that the first cost of carrying out this brain storm would be only about $50,000,000.

Some five years ago the Minnesota Forest Fire Commission asked the Federal Government for a number of airplanes, with which to patrol the woodlands of the state. At the time we are told Washington was favorably considering doing this. The Mexican situation and later the European War diverted attention from this most important work.

Plans are now well under way to patrol portions of the state of Minnesota with airplanes of the scout type, and the Superior Lake region with hydroplanes. Routes and courses have been mapped out; several landing fields have been secured for land-planes and one of the larger islands, with well sheltered coves, in the St. Louis River, has been obtained for the hydroplanes.

To the end that warning may be given families living in the outlying districts, so they may have at least a fighting chance to save themselves from an awful death, the Head of the Lakes Aero Club is working to get the Federal Government, through the National Forestry Commission to make these plans realities at once.

Duluth is particularly well situated for the headquarters of this work, and pressure is now being brought to bear from several directions to have a national training station for pilots located there.

At Cotton there was a semi-private roadhouse, Malik's, famous in the wide expanse of that wilderness, among the mining executives who speed back and forth in high-powered automobiles from Duluth to Virginia. Here we tarried for a couple of hours in the long northern twilight for a delicious dinner cooked to order by Mr. and Mrs. F. A. Malik, and which was consumed with a ravenous appetite that comes by simple contact with the

Views in and about the Terminal City of Duluth

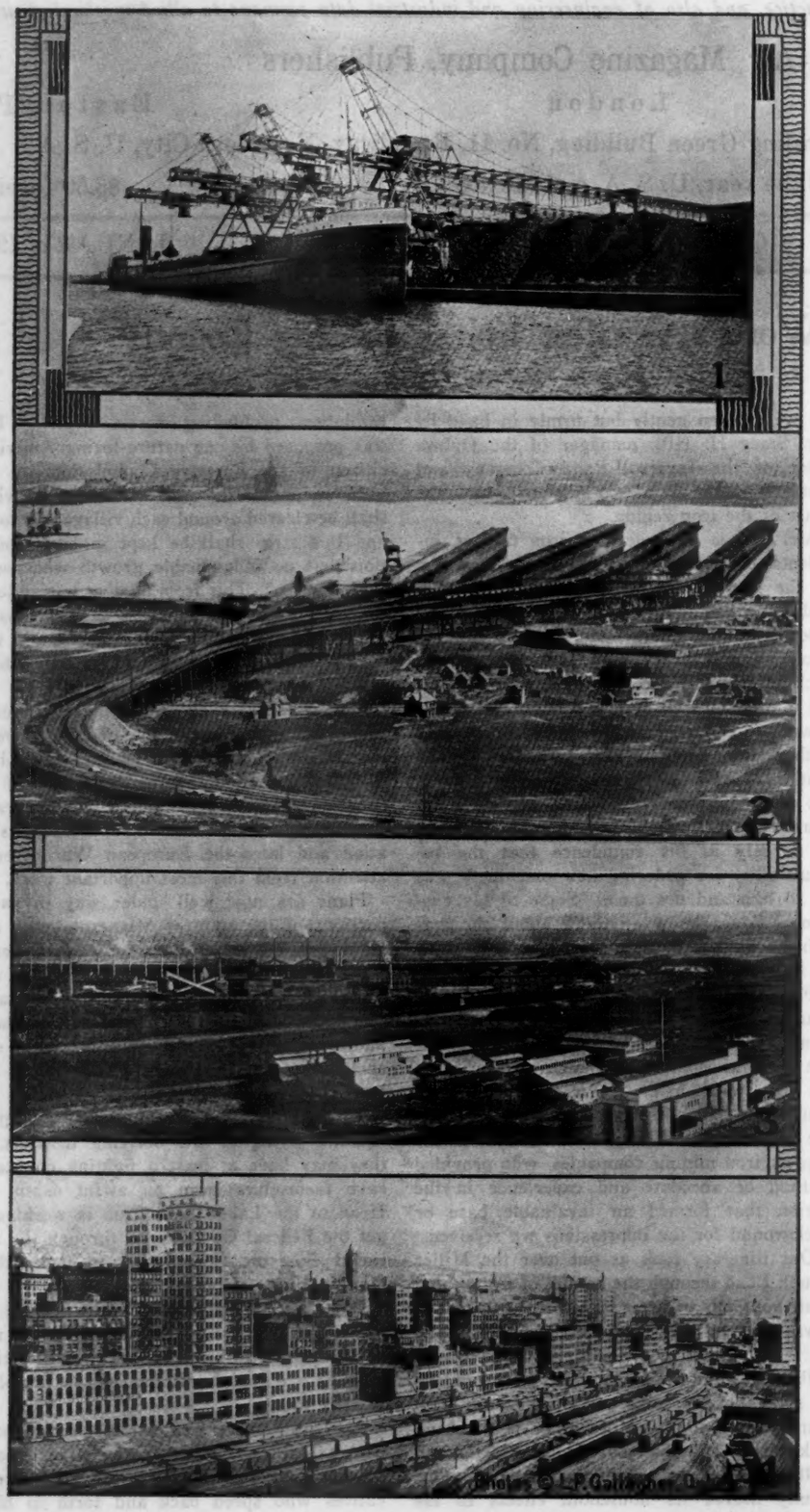


Fig. 1—Here is a modern coal pier at the twin ports of Duluth-Superior. More than ten million tons of coal a year are shipped from the Ohio ports to the head of the lakes. The machinery of a modern wharf for coal is operated by electricity and unloads 1,000 tons an hour. Fig. 2—This photograph shows the ore docks of the Duluth, Missabe & Northern Railway at Duluth. Each is 2,300 feet long and 50 feet wide. Dock No. 5, at the right, cost $1,500,000 and is a steel and concrete structure. About 16,000,000 tons of iron ore a year is shipped from these particular docks. Fig 3—Plant of Minnesota Steel Company, within the city limits of Duluth and eight miles from the city's centre; with site, buildings and equipment it represents an investment of $25,000,000 In the foreground is the Universal Portland Cement Company's plant. Fig. 4—A view of the central business section of Duluth, looking northward.

atmosphere of the region. At ten o'clock it was still light and we entered the automobile to bowl along toward Virginia, our night's objective, at forty miles an hour. We saw deer, a black bear, porcupines, rabbits and pheasants, which appeared startled and dazed by the brilliant headlights of the car, before we reached Virginia. Also mosquitoes that seemed as large as wasps after they had bitten one.

Virginia was the nearest we got to the smaller Vermilion Range, for our trip covered the lateral of the Mesaba Range. They spell "Mesaba" up there in so many different ways, that we have decided to standardize on the spelling given, for purposes of this article, although one may choose Missabe, Mesabi, Mesabe, or among other variations, according to fancy.

Prohibition was a much mooted subject around Virginia when we were there. There had been a local option variety before the coming of the war-time prohibition act and it had not been in unanimous favor. The men-about-town of Virginia were outspokenly rebellious, not to say despondent, over the Sahara-like state of affairs. Getting alcoholic refreshment was next to an impossibility, however, and the town had settled into a darkling gloom, as far as the high spots were concerned. Trains, autos and hip pockets alike were searched ruthlessly.

A road building contractor at Virginia about that time had a contract to build a new stretch of road out in the country and he applied to the mayor for permission to rent some of the city's road maintenance equipment, included in which was a steam road roller and a water sprinkler. His idea was to rent the equipment, saving him considerable in outlay, and to return it in exactly as good condition as that in which he received it. If the equipment needed any repairs after he had finished with it, according to specific terms he finally negotiated with the city, he was to send it away for repairs, if necessary, and at his expense.

The contractor carried out his terms faithfully, although he found it necessary to ship the water wagon to Minneapolis for repairs. It came back as good as new and nicely painted, but within a week after it was back in the city's possession, there was a municipal scandal in the newspapers. Many well-jingled persons were seen about the town, as of yore, and liquor was as plentiful as though local option were a dead letter. Where the liquor came from was a mystery to those entrusted with the enforcement of the law, until the day when the water wagon was trotted forth to sprinkle a dusty street. The driver lifted the trap at the top to insert the water pipe and was nearly overcome by an outrush of the fragrant lurking fumes of rye. It turned out later, as an open secret, that several barrels of perfectly good liquor had found their way into the waterwagon on its home trip by railroad from Minneapolis. But nobody could prove anything, so the dry spell, thanks to the irony that may lie in a waterwagon, was broken for a considerable period. The joke

[*Continued on Page 9499*]

Scenes in the Iron Mining Industry of Northern Minnesota

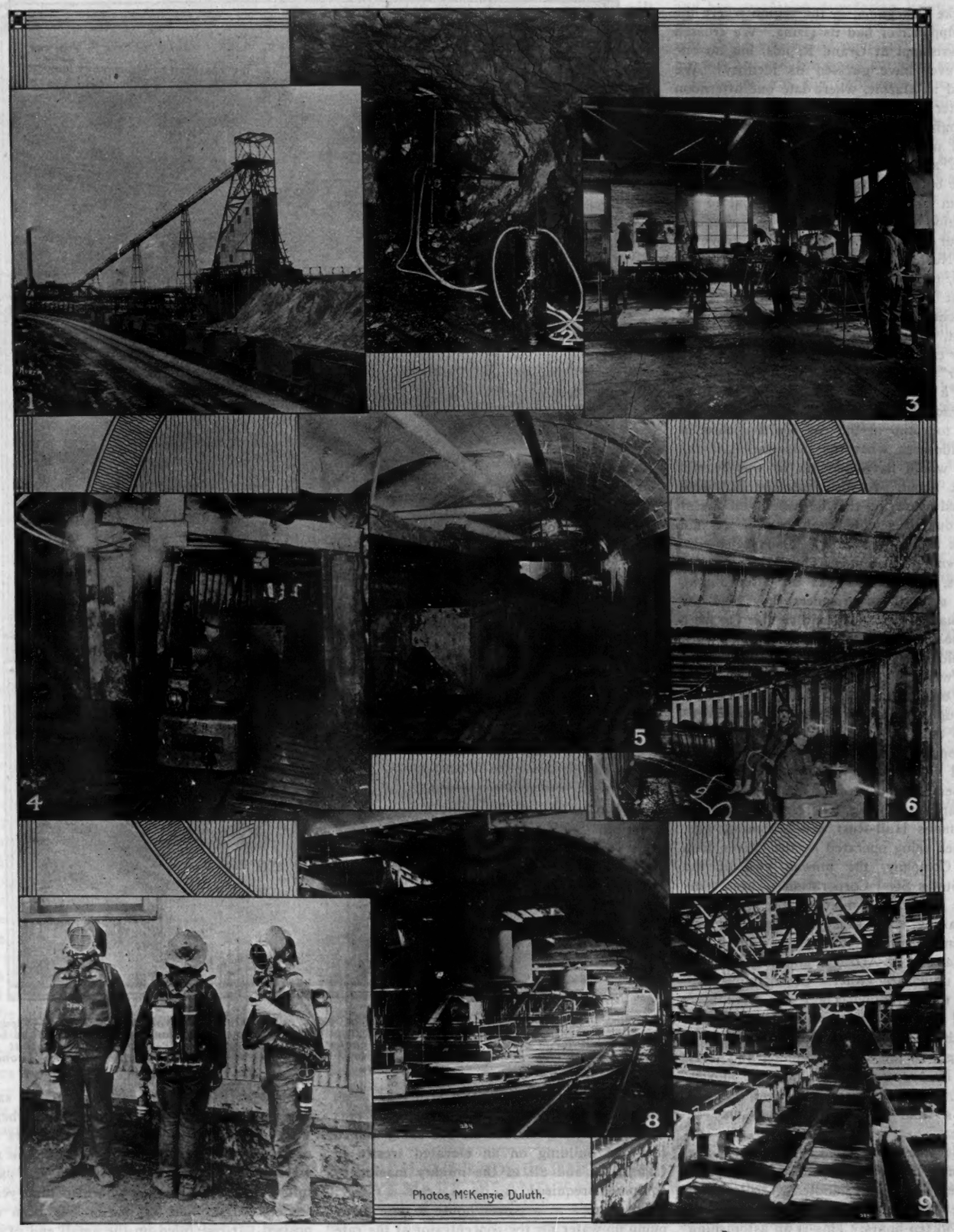


Fig. 1—The "B" Shaft of the Pioneer Mine at Ely, Minn. 2—Water Leyner Drill, No. 18, used by the Oliver Iron Mining Co. at Ely, Minn., showing Leyner water tanks attached. Fig. 3—Leyner Sharpener outfit at the Cleveland Shaft Mine, Cleveland Cliffs Iron Co., Marquette (Mich.) Range. Fig. 4—Electric locomotive in the "C" Tener shaft. Fig. 5—Main drift of the Philbin Mine of the Oliver Iron Mining Co. on the Mesaba Range. Fig. 6—Main drift in the Leonidas Mine at Eveleth, Minn. Fig. 7—Rescue squad of an underground iron mine, showing Draeger gas helmets and kits. Fig. 8—Tram floor of washing plant for ore at Coleraine, Minn. Fig. 9—Washing tables at Coleraine, Minn.

came out and all Minnesota rocked with glee.

Our itinerary from Virginia led to Hibbing, thence to Coleraine and on to Grand Rapids, and Lake Pokegama, in the region where the Mississippi River had its rising. We crossed the Mississippi at Grand Rapids, but no one would ever have guessed its identity! We returned to Marble, where late one afternoon the writer borrowed fishing tackle and a boat and caught six different varieties of bass and pickerel in Twin Lake in less than an hour with an artificial bait. It was necessary to hide the bait in casting or else the fish would jump out of water and into the boat to get at it, which of course would not be true sport!

On our way back to Duluth we drove by way of Nashwauk and Keewatin, to Chisholm, to Buhl, to Eveleth and thence into the city. The last hundred miles was made in practically one jump, and as we had suffered a blow-out, there was no spare tire to fall back upon in case of further disaster. The word "disaster" is used advisedly, for we drove through a wild country late at night far from the comforts of garages. If we had been obliged to camp in the car for the night in that wilderness what the mosquitoes of the country would have done to us was fearful to think about. At this juncture Mr. Hill comforted by saying that he hoped and guessed all four tires would hold out, if we had any luck at all, and he was also pretty sure we had enough gasoline. The Indians, in the old days, he remarked as an afterthought, used to strip those prisoners they held the deepest hatred for, and would tie them to trees out in the swamps, letting the mosquitoes work their wild will upon them. We were glad that we were able to maintain about 35 miles an hour on that last night's ride into Duluth, even though we did arrive at two in the morning with only about a half teacup of gas.

We stopped at many places en route on the tour and visited the great open pits, and in some cases, the underground mines. The largest pits are at Hibbing, where are located the world-famous Hull-Rust and Mahoning pits, the former being operated by the Oliver Iron Mining Company, the mining end of the United States Steel Corporation. These comprise the greatest pit mines in the world and in the failing slant rays of an evening sun they resemble nothing so much as a miniature Grand Canyon of Arizona, and they are not so *very* miniature either. Seventy-five millions of tons of almost pure ore have been shovelled out and entrained from these vast holes in the ground. The greedy steam shovels are eating into the city of Hibbing and forty acres of its business section is to be moved, buildings, asphalt pavements, sewers, wires and all, so that the underlying ore may be taken out.

At Coleraine we visited the Trout Lake Concentrator of the Oliver Iron Mining Company, where have been handled 23,500 tons of crude ore in one day and 15,800 tons of concentrates in ten hours. This is an astonishing structure of steel and concrete in the building of which 7,000,000 pounds of steel and 2,000,000 feet of lumber were used. Its five units are the largest in the United States, and probably in the world. The structure is so massively built that it supports 10,000 tons of ore at a time, besides the ore being hauled into the building on an elevated trestle in trainloads, and all of the mighty machinery equipment required.

The pumps at a power house a mile away pump up water for the concentrator at the rate of 6,000 gallons a minute. The process at the concentrator takes such ore as cannot be shipped directly to the smelters, because too impure, and increases the percentage of iron content in the ore by washing out the sand and reducing the silica content. After being washed out and loaded back into the cars the ore is dryer than when it came in. The red water residue runs like a river of red paint into Trout Lake nearby, where in nine years some 7,000,000 tons of matter has been deposited. It has filled up the small end of the lake so that the paint-like stream now deposits into water 130 feet deep.

At the Holman Mine at Taconite, Itasca County, we went down into the open pit at

Views in the Great Open Pit Mines of Minnesota

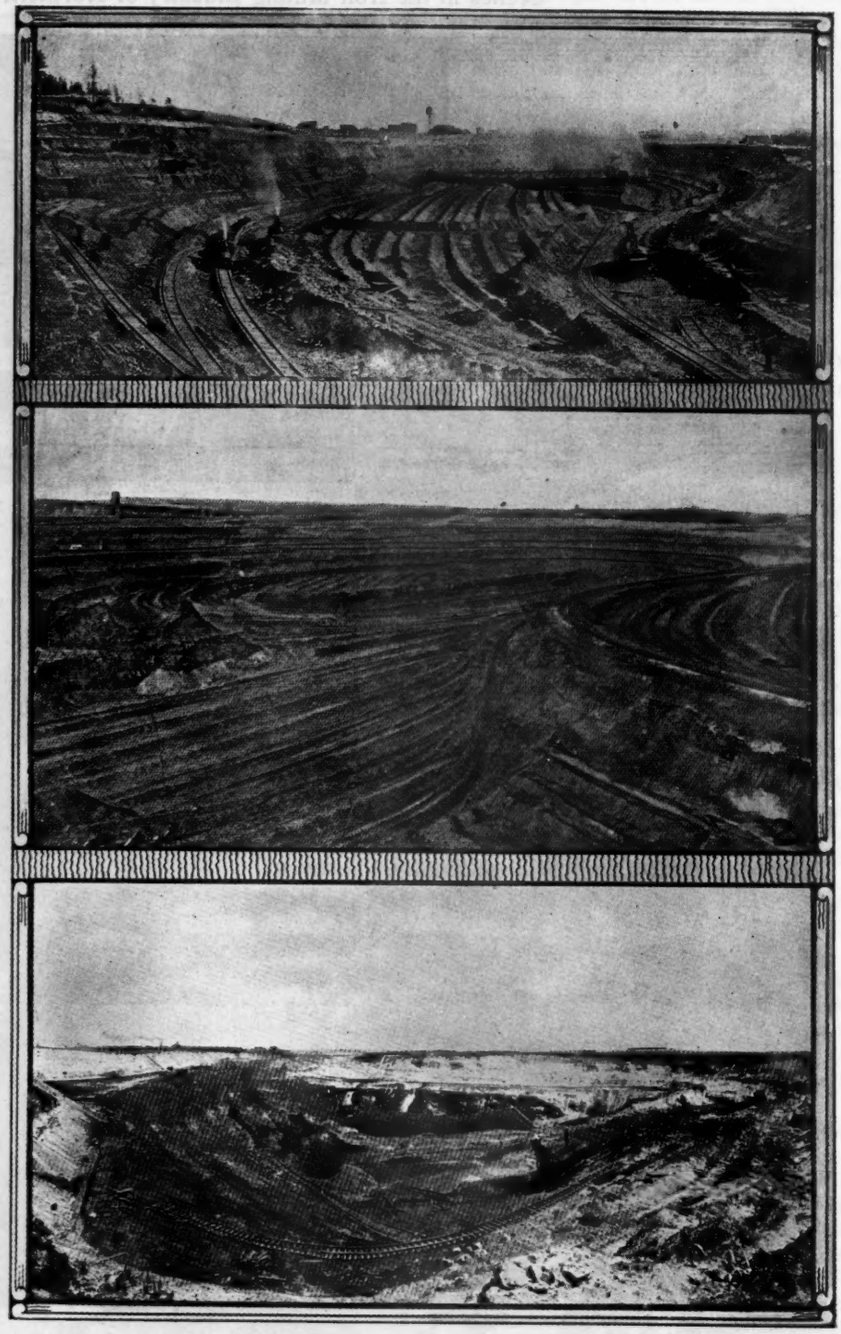


Fig. 1—Steam shovels and ore trains at work in the Mountain Iron Mine. Fig. 2—View in the vast Mahoning Mine at Hibbing, Minn., from which millions on millions of tons of ore have been removed. A large section of the business center of Hibbing is being removed in order that the steam shovels may get at the underlying ore. Fig. 3—View showing stripping of the Leonard Mine at Chisholm.

ten in the evening to see by the remaining daylight a natural wonder uncovered by a steam shovel. A whole pine tree in a fairly good state of preservation, and unpetrified, had been found beneath 75 feet of glacial drift, sand, gravel and other debris. Pine cones were found near it. The tree was millions of years old and had been brought down by the Great Glacier or ice cap that once covered the continent down as far south as the Ohio River. Sharks' teeth were found in the same pit. The writer hopes that someone preserved a good-sized portion of that tree. Through our instrumentality an article appeared in the *New York Evening Post* about it, and later a formal report was made to the American Museum of Natural History at New York, samples of the wood being sent to that institution, but the reply was that the Museum had no funds with which to procure the tree and ship it east.

Beginning in 1902, Minnesota ranked first among the states of the Union in the production of iron ore. Although it was true that the iron ranges in the northeastern part of the state had been explored before the Civil War and were known to contain vast amounts of ore, it was not until 1884 that mining was actually begun on the Vermilion Range. Since that date the development of iron mining in Minnesota has been truly amazing, and the increase in volume and value of output has been uninterrupted.

In 1892 the much richer Mesaba Range, the most productive iron range ever known, was opened up. Quickly it surpassed the Vermilion in its output and within a decade its output was ten times greater.

The ore is found in many places in an almost pure state. It is at, or near the surface, and the process of mining is one of great ease and simplicity, excepting in the shaft mines, where it is much easier than in most other kinds of mining. Great open pits, in some instances miles across and hundreds of feet in depth, are dug with powerful steam shovels, which dump the ore into waiting trains of cars, which in turn convey it to the head of the lakes.

The bulk of the vast tonnage is transported by big steamships on the Great Lakes from Duluth, Two Harbors and other points to the Lake Erie ports, or to the Lake Michigan ports in the vicinity of Chicago, where it is converted into pig iron and later into steel. A large tonnage is smelted and made into steel at the highly modern and efficient plant of the Minnesota Steel Co., on the outskirts of Duluth.

The quality of the ore in the two ranges differs somewhat. That mined on the Vermilion is a hard specular, or red haematite, while that taken from the Mesaba, largely red haematite, is much softer and in many localities, quite finely comminuted.

Throughout the Minnesota iron country, in the underground mines and elsewhere, compressed air machinery and air drills and drill sharpening equipment, is, perforce, in widespread use. We found the great bulk of this equipment was furnished by the Ingersoll-Rand Company, of New York, through its Duluth office; in fact the competition from the that great organization's rivals, who are naturally represented in the region, was negligible.

Some day a great American novelist will settle in Minnesota for a year or two and absorb its wonderful story and do it justice. It should be a writer who knows wild life, and who can do "rough stuff," as they say in the movies, for it will be a virile tale. Another Jack London might do the trick, or a man like Rex Beach or Zane Grey. In the compass of an article like this, one can only hint at its possibilities. It is a land where a millionaire will put a sixty-pound pack on his back and with his little dog tent and snowshoes sally out into the winter wilds and camp out to defy the elements. Men wealthy enough to buy an entire state have done this just for the sheer fascination of it.

One impecunious man, now chief engineer of a big mining company, used to have the same call of the wild. It was his habit at intervals to fare forth into the wilderness alone and sleep in a shack with the temperature hovering around 25 degrees below, battling with the country for food and warmth. Some 27,000 men of this kind of type, capable of taking care of themselves under any circumstances, were in the 32nd Division of the A. E. F., brave, fighting, two-fisted men, all of them, of whom some 18,000 laid down their lives in the great overseas struggle for freedom and civilization.

The land contains many strange, wild characters, brought by the mining game from odd parts of the world. Among them are Montenegrins, quite a colony of whom are to be found around Hibbing. One day two of these Montenegrins, who were "partners," had a quarrel over a trifling matter. After high words they finally left the mine where they were working, went to their room and each wrote a note, after packing his personal effects, saying that if anything "happened to him" his partner was to have his worldly goods.

They next went into town together to a hardware store and bought two revolvers exactly alike, with ammunition, and repaired to an isolated lonely place outside the town. There were no seconds, although people had become aware of their preparations and knew their significance. However, it was regarded as no one's business, and they were not molested.

The men grasped each other by the left hand, and after they called off "one, two, three," in unison, each fired at the other with the right hand. One fell dead instantly and the other was badly wounded, but ultimately recovered.

Here was no French duel, but a thorough sporting proposition.

LAUNCH SUPERDREADNOUGHT AT MARE ISLAND YARD

The hull of the superdreadnought *California* is at the Mare Island Navy Yard where the completion of her super-structure is going forward. The *California* is to cost more than $15,000,000, and will carry twelve fourteen inch guns. She will be electrically driven and operated. Her turbines of 28,000 horsepower are the principal units of the electric system. The guns will be fired by electricity and her ventilation, laundering, printing, cake making, dishwashing and ice cream freezing will all be electrically operated. Compressed air will be used for many purposes on board.

In commission the *California* is to have a crew of 1,022 men and 58 officers. She has a length of 624 feet, a breadth of 96 feet and a depth of 47.2 feet. At her mean draft of 30.5 feet her displacement would be 32,000 tons. She has an estimated speed of 21 knots and a normal fuel capacity of 1,900 tons.

When the giant craft was launched in November she was christened by Mrs. Randolph T. Zane, daughter of Gov. William D. Stephens of California, before thousands of spectators. As the giant craft slid into the water the brakes rigged up to slacken the momentum failed to hold and the hull crashed into a pier, tearing away the piling. The damage was slight and no one was injured. Soon after she took the water the keel of a great companon superdreadnought, the *Montana,* was laid in the vacant berth.

The hull of the new ship cost $7,800,000. The award was made at the same time the *Tennessee* was contracted for. The *Tennessee,* which was built in an Eastern shipyard, was to have been a sister ship of the *California,* but she was launched before many of the improvements going into the *California* hold were brought to the efficiency they have to-day.

AIR MACHINERY EXPORTS

The Statistics Division of the Bureau of Foreign & Domestic Commerce of the Department of Commerce at Washington has provided us, for publication, with the following table of exports from the United States of air compressing machinery, by countries, for September, 1919:

Countries.	*Dollars.*
Belgium	525
Denmark	196
France	42,814
Italy	118
Netherlands	14,914
England	22,216
British Honduras	107
Canada	32,200
Honduras	2,454
Panama	94
Mexico	29,353
Cuba	2,421
Dominican Republic	196
Brazil	2,521
Chile	5,243
Colombia	136
Peru	6
Uruguay	4,500
China	352
British India	100
Hongkong	2,032
Japan	8,551
Australia	37,475
New Zealand	665
Philippine Islands	340
Belgian Kongo	43
British South Africa	3,137
Total	$212,709

B. H. Gardner, for the past two years manager of the New Britain district of the Connecticut Light & Power Co., has been promoted to the position of sales manager of the commercial department of the company with headquarters in Waterbury, Conn. He is succeeded by N. S. Franklin, assistant superintendent.

Most Powerful Electric Engine Tested Against Two Steam Engines

Fig. 1—The largest and most powerful electric passenger locomotive in the world, and witnesses of test made at Erie, Penna. Fig. 2—A tense moment just as the test began. Fig. 3—The actual tug, or rather, "push" of war, showing the electric monster pushing back the two powerful steam locomotives. Fig. 4—Test of the regenerative braking power of the electric engine. The two steam engines are using all their power to push the electric forward, but the latter is holding them back and at the same time generating current. For explanation, see article.

WHEN 150 prominent railway men and engineers from many parts of the United States and Canada, gathered at Erie, Pa., recently, to witness trial tests of a new type of gearless electric passenger locomotive, they believed, most of them at any rate, that the exhibition would be of a quite perfunctory nature. Instead they saw what F. J. Sprague, noted consulting engineer and known as "the father of railway electrification," described as "the most magnificent exhibition of electricity applied to railroads, that the country has ever seen." "Indeed," added Mr. Sprague, during a dinner which followed, "I think the thing has never been duplicated in this, or any other country."

The feature of the exhibit was highly unusual in the annals of electrification, for it was a test of brute strength between two powerful steam locomotives and one new electric—nothing less than a tug of war, or rather "push of war."

Two modern steam engines,—the kind the New York Central uses to haul its big limited trains—were switched to the spur of track and coupled securely to the electric locomotive. If the two contestants had hauled in opposite directions there might have been danger of pulling out the draw bars and a resultant accident. This possibility was avoided by having them push against each other in different directions.

At a given signal from the supervisor of tests, the steam engines got under way and began shoving the big electric ahead of them along a short piece of straight-away track; then the current was gradually turned on the electric while the engineers of both steam locomotives opened up their throttles to the last notch.

What was the surprise of the crowd to see the steam engines slowly but surely lose momentum and finaly come to a complete stop still with their throttles open wide, puffing and chugging as under an extraordinary strain. Then what appeared to be the impossible happened. The steam engines were forced backward, first only by inches, but gradually, as the full power of the electric was brought into play, they were thrust steadily backward at an accelerated pace and the electric locomotive was declared the victor in the test.

Interesting and spectacular as this test must have been to the laymen present, it was more significant to the engineers of the General Electric Company, who had devoted years of their life to the perfection of this powerful electric locomotive, for it was regarded as a conclusive test of power between steam and electricity.

"Yet," as W. B. Potter, chief engineer of the railway department, remarked, "it was not railroading."

Mr. Potter's statement was provoked by the quite natural inquiry from some one who asked what became of all the electric current which was being used by the locomotives in the test when for a considerable period it hardly moved at all, although the switch was "on" fully. Although the test showed that the electric exerted the greatest power, the steam locomotives were 100 per cent. efficient while the efficiency of the electric was zero.

The current used by the electric locomotive continued to flow through the driving motors even after they had exerted their full strength. This current was wasted. On the other hand the steam locomotives used their steam only up to the limit of their endurance and when this point was reached there was no waste.

Hardly second in interest to the tug of war, was an exhibition of the regenerative powers of the electric locomotive which preceded it. The locomotive, which is one of five being constructed for operation on a new electrified branch of the Chicago Milwaukee & St. Paul R. R., hauls over a mountainous district and must frequently coast down steep grades. The engineers have so designed the locomotive that by the turn of a switch, it turns its power plant into a generating station and sends back quantities of "juice" to the power station, when it is "coasting." In other words the electric motors are converted into electric generators.

This process of regeneration also acts as a brake to the progress of the engine down a

hill, while at the same time it stores up new current which will later be called upon to propel the locomotive on the level or up the next grade.

The strength of the regeneration braking was given a spectacular exhibition. To reproduce the same conditions as those which exist when the engine is coasting with a full load of cars behind, two steam locomotives were coupled on behind the electric and pushed it along the track at a good speed. The regenerating system was then switched on and the steam locomotives soon found they were bucking against strong resistance. To overcome the regenerative braking power of the electric, the steam engines quickly were puffing like a stout man running for a train. Soon the speed was seen to decrease noticeably and before the trial was completed the two big steam engines had pretty much all they could do to make headway under full steam. All of this time the electric was turning back current to the power house, the dials of which indicated this to a group of expectant engineers who had gone inside to watch them with growing interest.

This new locomotive is said to be one of the most powerful passenger locomotives in the world. It uses 3,000 volts direct current and has horsepower of 3,240. There are fourteen axles on which are mounted motors, each of which by direct connection turns one set of driving wheels. The locomotive is 78 feet long, seventeen feet high, and weighs 265 tons, of which weight it is surprising to know that 229 tons rest on the drivers. The locomotives have been designed for handling in normal service a twelve-car train weighing 960 tons trailing against a grade of two per cent at 25 miles per hour. Tests have shown that the gearless electric locomotive operates at ten per cent higher efficiency at 50 miles per hour than the gear type. The centre cab is occupied by an oil fired steam boiler for heating the passenger trains, and also contains accessories including tanks for oil and water circulating pumps, and a motor-driven blower for furnishing forced air draft.

In addition to officials of the Chicago, Milwaukee & St. Paul, the General Electric Co., the Canadian National Railway, the Canadian Pacific and the Hydro-Electric Power Commission of Ontario, who attended the exhibition tests, the following American railroads were also represented: New York Central, Nickel Plate, Sante Fé, Rock Island, Michigan Central, Great Northern, Illinois Central, New York, New Haven & Hartford, Baltimore & Ohio, Pennsylvania, Temiscaiming & Northern Ontario, Chicago & Northwestern, Chicago, Burlington & Quincy, together with a group of private consulting engineers and officials of the American Locomotive Company.

AIR CELLS INSULATE CLOTHES MADE OF ASBESTOS

Asbestos clothing, we read, is now expected to take its place in the wardrobe by the side of garments of cotton, wool, silk, fur, leather and rubber. Its advocates say it will provide a garment that will at once shut out the scorching heat of summer and the stiffening cold of winter.

Asbestos is a delicate fibrous sort of vegetable mineral. It can be carded, spun and woven like silk or flax and resembles flax so strongly that it has long been called mountain flax. The possibilities for working this substance can be estimated from the fact that scientists have not yet discovered how finely asbestos fibres may be split. A microscope magnifying 900 diameters revealed fibres that are estimated to be five one-millionths of an inch thick.

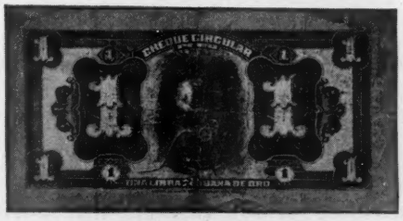
These delicate strands vary in length up to five or six feet and some of the shorter fibres have very great tensile strength. Because of these facts this material in many respects is more adaptable for textile manufacturing than cotton or wool. Its beautiful white, gray, green and blue hues will lend a beautiful natural color.

The powerful heat resisting qualities are explained by the fact that there are countless air cells lining the myriads of minute threads into which each fibre is subdivided.

Nor is the use of asbestos as a textile new. The ancients wove it into handkerchiefs. Charlemagne had a tablecloth of this substance, cleansing it when soiled by casting it into a fire. Let the laundryman take notice.

Today it is fashioned into thick firemen's cloaks in which the fire-fighters can move through flames as long as they can hold their breath. Gloves for handling very hot metals are made of it.

AIR DRILLS SHOWN AT WORK ON PERUVIAN BANKNOTES



A representative of the Ingersoll-Rand Company, New York, who returned last year from the West Coast of South America after a business sojourn there, brought with him from Peru two specimens of Peruvian banknotes, which we herewith reproduce with the knowledge of, and by courtesy of the Peruvian Government. These banknotes show on their reverse side mining drills operated by compressed air of types manufactured by the Ingersoll-Rand Company and were engraved for Peruvian bank customers by the American Banknote Company. This currency constitutes an unusual kind of indirect advertising for an American corporation in a foreign land.

Mining is a most important industry in Peru and is the source of that country's greatest wealth. That American mining machinery should be so generally used as to warrant using reproductions of it as a symbol on the currency of the country should not only be a matter of considerable general interest, but of special pride to the company manufacturing the equipment depicted.

FOREIGN TRADE CONVENTION FOR SAN FRANCISCO

America's first world conference of American foreign traders, with special trade advisors from the Far East, Australasia, and South America, appointed by the various foreign governments, will be one of the important features of the seventh national trade convention to be held at San Franscisco, May 12-15, 1920, according to the preliminary plans of the convention announced at the annual meeting of the National Foreign Trade Council.

Elaborate preparations for the convention are being made on the Pacific Coast. The Seattle, Portland, San Francisco and Los Angeles chambers of commerce are coöperating in plans to make the journey to the Pacific Coast attractive for those who attend the convention. Seattle is arranging an exhibition of products of the Far East, San Francisco an exhibition of Pacific Coast products, and Los Angeles an exhibition of the products of South America and Australasia.

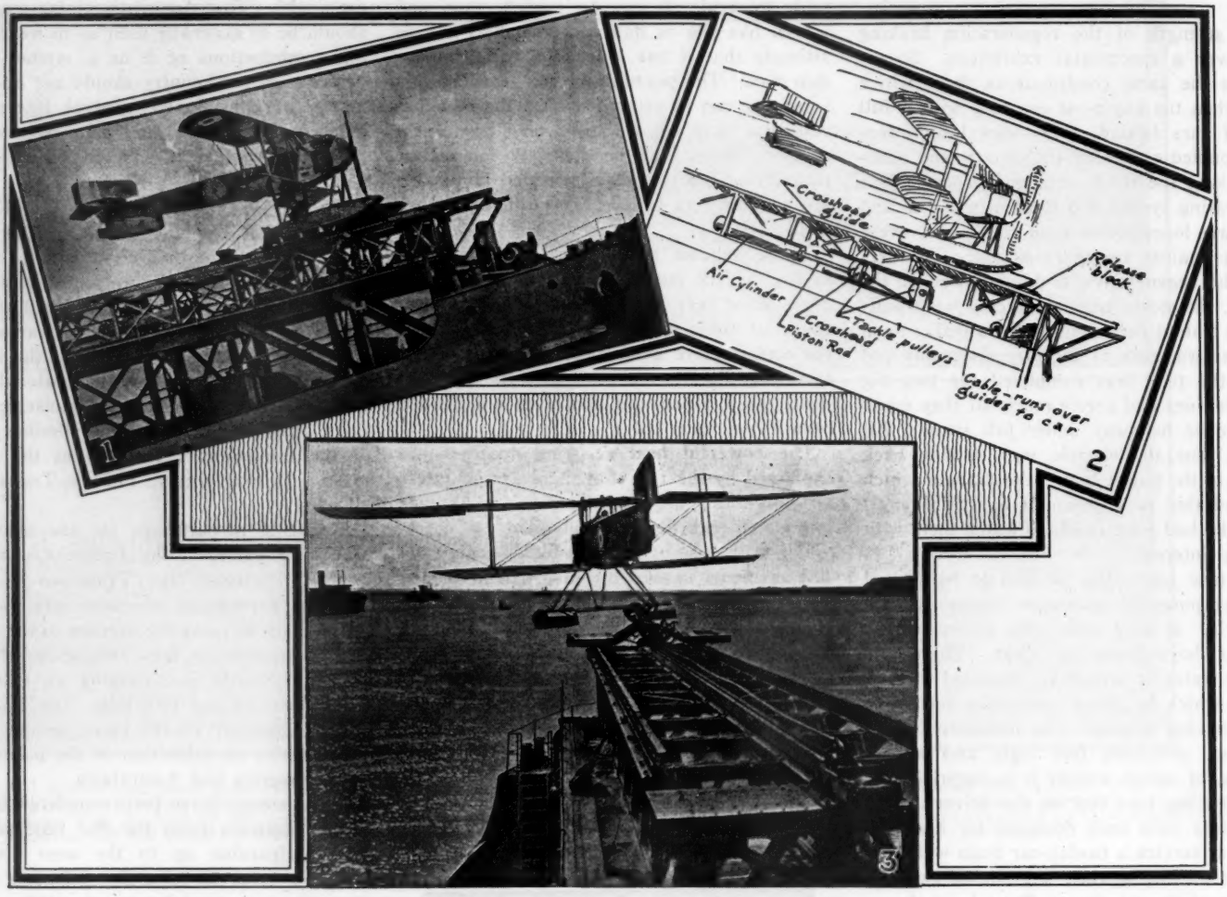
Arrangements have been completed for two special steamers from the Far East and one from Valparaiso up to the west coast of South America to bring the delegates to the convention. A special steamer will be provided to take delegates from the east through the Panama Canal to San Francisco. This ship will sail from New York about April 20. The convention programme will consider chiefly the effect upon American foreign trade of the fact that the United States became a creditor nation during the war. American traders are giving careful study to the increase of imports that is bound to come into this country in satisfaction of the annual interest upon the huge loans that have been extended to Europe. This question will be threshed out from every angle at the San Francisco convention.

Special trans-continental trains are to be provided for the convenience of delegates in the United States. These trains will be made up of special cars from various cities, for reservations in which applications should be made to the National Foreign Trade Council, No. 1, Hanover Square, New York City.

A. B. Parsons, metallurgical engineer on the staff of the Butte & Superior Mining Co., became an associate editor of the *Mining and Scientific Press* on December 1.

Lindsay Duncan, formerly chief engineer to the Nevada Consolidated Copper Co., and Curtis Lindsley, Jr., mining and construction engineer, have formed a partnership with headquarters in the Mills building, San Francisco.

A Compressed Air Operated Catapult for Launching Airplanes from Ships



[Photos Copyright, 1919, Int. Film Service]

1—Nearing end of run on launching runway. 2—Mechanism used to launch airplanes from battleship. 3—"Hopping Off." The plane has been automatically released at the end of its run.

THROUGH the courtesy of the Bureau of Naval Construction, we are enabled to furnish a description of a new and interesting use of compressed air, that of its employment in launching airplanes from the deck of a ship. It is a case of into the air by the means of air.

It will be recalled that the experiments of the Wright Brothers were carried on with the aid of a launching device. At that time the plane was equipped with skids and ran along a track. A cable was attached to the forward portion of the plane by means of an automatic coupling and, running around a pulley at the forward end of the track, ran back to the rear end underneath, thence up to the top of a tower around another pulley and was there attached to a weight. When the airplane was launched the weight was released and, in falling, drew the airplane along its runway with increasing speed until it was automatically released at the end.

Later experiments resulted in sending up airplanes under their own power from the land or from the water, but when the question arose of launching them from the decks of ships, the old Wright idea was again brought into use. This time however, it was modernized and considerably improved, and a glance at the accompanying photographs will show its present development. It will be noted that the device consists of a straight-pull air cylinder operated through a tackle attached to a launching car on a trackway. It is designed for launching airplanes of weights up to 6,000 pounds at 65 miles per hour.

The launching runway is given as large a range as possible in the limited deck space available so as to reduce the acceleration necessary to bring the plane up to the speed required for launching. This runway is installed at considerable height above the deck for the double purpose of obtaining a clear run aft, and allowing sufficient height of the track above water to give space for recovering in case the plane does not "hop-off" exactly true. The planes are stowed on the ship and secured to a launching car, which is in turn carried by a transferring car. The latter is fitted with a turn table to make it easy to stow planes in the most convenient position. To transfer the planes to the launch track, the transporting car is run out on a short piece of track fastened on top of a turret, bringing the plane up to the end of the launching runway. Here the launching car is detached and run from the transferring car on to the launching track. The plane is secured to the launching car by means of a device arranged to automatically release it near the end of the run when the plane is up at speed, so that it may leave the launching car without shock when the latter is stopped by means of a buffet.

The launching car is now set up against a trigger of the release gear at the forward end of the launching track by means of a small preliminary tension on the line. The airplane engine is started and as soon as it is up to speed and running true a trigger is released and by the same movement, air pressure is admitted to the operating cylinder of the catapult. The launching car is drawn forward by the combined pulley of the air plane propellers and the cable attached to the launching car operated by a compressed air cylinder. At the end of the run a bracket beneath the launching car encounters buffet springs at the end of the track, and through them operates pneumatic buffet cylinders to bring the car to rest without shock. At the same time the piston of the catapult is cushioned in the end of the cylinder to bring it to rest. The air cylinder used differs in no essential respect from that known as the straight-lift air hoist.

Wheels on Wheels—Mobile Repair Shops in the United States Army

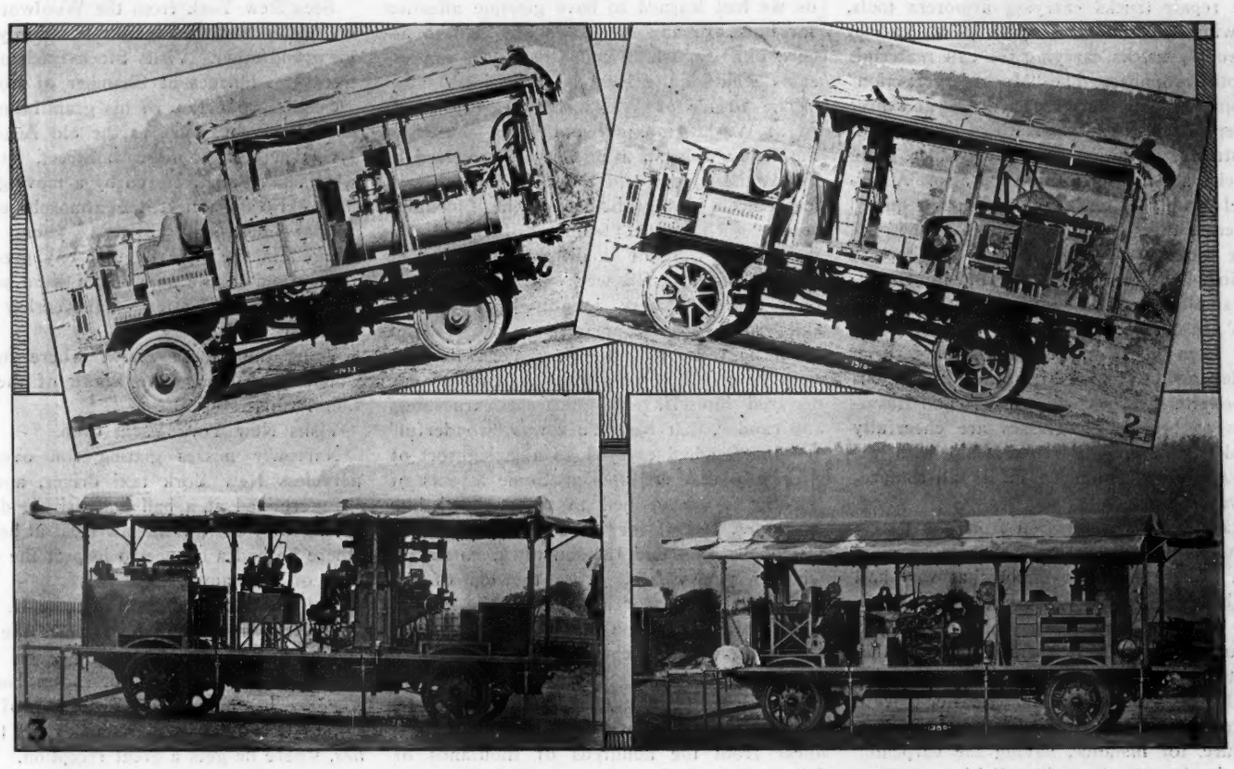


Fig. 1—Air compressor truck. Fig. 2—Power saw truck. Fig. 3—Milling machine trailer. Fig. 4—Welding and forge trailer.

By MIRIAM F. McCONAUGHY

IN THE autumn of 1918, about the time the Hun began to weary of pressing *kultur* upon an incredulous and unappreciative world, the U. S. troops in France were using more than 11,000 big guns, howitzers and mortars, with their carriages and mounts, in addition to more than one and one half million rifles, 345,000 pistols and revolvers, approximately 3,000 tractors varying from two and one half to twenty tons, and more ordnance equipment of other kinds than could be listed in the compass of this article.

They were good guns and carriages and rifles and tractors, but the best of guns must occasionally break and many times the injury is such that it cannot be mended on the field at once by amateurs. Nor is a piece of heavy artillery a thing to be lightly tucked under one's arm and blithely carried to a repair shop. The 9.2-inch, for instance, weighs 9,575 pounds, and the 12-inch is a dainty little thing of about 57 tons.

So that the question of repairing these guns became a Mohammed-and-the-mountain proposition. Since the guns quite obviously could not be carried to the ordnance repair shops far behind the lines, repair shops must be brought to the guns, or near enough to the guns for tractor transportation to them, and this is what was actually done.

In 1914, before the Hindenburg line entered upon its wild career, Colonel James L. Walsh (then Captain) down on the Mexican border, dreamed of an immense and complete organization of repair shops, tool-rooms, lathes, power generators, air compressors, huge cranes, executive offices and a score of other accessories of the well equipped repair shop—*on wheels,* that could chug right up to an injured gun, repair it, and chug right off again. And it didn't end with dreaming. He worked the thing out in practical detail before there was a regular war, and in November, 1917, work was begun on the realization.

The shops were divided into two classes, the Heavy Mobile Artillery Ordnance Repair Shops and the Light Ordnance Repair Shops.

The first type consists of two sections, identical in make-up, but each perfectly independent and self-contained. This doesn't mean that they had learned to curb their tempers, but that they carry their own food, offices, supplies, power, fuel, sleeping accommodations, staff, motorcycles, trailers, machinery, and are thoroughly capable of working and travelling for several days at a stretch without any assistance whatever.

These two sections, containing 24 units each, are again divided into two sections, known as Repair and Supply.

The former includes three three-ton trucks of the repair type comprising a tool-room suitable for a wide variety of bench-work and carrying all the essential outfit of a machine shop, an air-compressor with a complete set of pneumatic hammers and chisels, and a forge truck; five five-ton trucks consisting of a complete generator for electric current to run the machine, a lathe, a blacksmith shop and an acetylene welding outfit, a drill press and shaper, milling machine trailers; and a motorcycle with side-car for carrying light materials and doing general errands.

The Supply Section is larger and contains six five-ton trailers of supply parts, completely housed and provided with bins of various sizes similar to those in the stock rooms of the stationary shops; six three-ton trucks of the repair type for carrying large spare assemblies; two motorcycles with side-cars, one solo-motorcycle, and one one-ton delivery truck.

In addition to these, there is an office truck comprising one five-ton trailer with machine shop body, two three-ton trucks with repair bodies slightly altered to accommodate equipment of desks, files, etc.; one three-ton truck of the ammunition type for carrying fuel in drums; one nine-passenger touring-car for staff observation purposes, and one rolling kitchen of the trailer type.

These three sub-sections make up a section, and two such sections make up a shop. Nine shops are required per Army, eight for the eight heavy artillery brigades and one for the tank corps. Two four-ton cranes are also included in a shop, having 165 feet of crucible steel cable, 3-8 inches in diameter and blocks with a capacity of six tons. A personnel of 103 officers and men is required for each Heavy Mobile Artillery Shop.

The Light Mobile Ordnance Repair Shop operates still nearer the front and is attached to divisions and Army Artillery Parks, being a lighter organization similar in type

to the heavy shops. Here the first section, known as the "Equipment Section" consists of three repair trucks carrying armorers tools, a sewing machine, and spare parts, and of two supply trucks carrying the raw materials and other supplies. The "Machinery Section" contains three artillery repair trucks and three artillery supply trucks. A third section, administrative in duties, carries the office. Motorcycles are in use in this shop also. A personnel of only 27 officers and men is required to operate this.

The range of work done in these shops is amazing. The repair of heavy and light artillery, small arms, carriages, mounts and vehicles are only a part of their work. Everything from motor-trucks to victrolas, from bicycles to shower-baths, from rolling-kitchens to typewriters, from stone-crushers and steam-rollers to broken eye-glasses are cheerfully lugged to the mobile repair shop with the most sanguine confidence in its all-comprehensive scope.

Regarding this innovation from the peace-time viewpoint, we might say it looks good to us. There is small doubt that we shall soon have just such travelling shops on a minor scale in many industries. The traction companies already have them—repair cars that rush to the rescue. Large plants must inevitably adopt the same plan. Smaller private industries are sure to follow suit.

Picture, for instance, having the carpenter arrive in the morning with all his necessary tools and implements waiting outside in a well-equipped vehicle, so that he could begin work *the same day!* Verily, a fairy dream this! Or conceive, if you will, of a shop rolling up to your back-porch containing implements for any plumbing emergency—mending your leaky pipe or the broken boiler or the smoky furnace—whatever the trouble may be so that you have merely to send in a hurry call for the plumber without wrangling with all his assistants regarding the exact location and nature of the difficulty before anything can be done, the while your bath-room drowns or the family suffocate.

And yet, who shall say it may not be! Perhaps the Hun has handed us something better than *kultur*—something evolved from two strenuous years of invention born from necessity.

H. R. H., THE PRINCE OF WALES, WARMLY RECEIVED

AMERICA is grateful for the visit paid to this country by the Prince of Wales, Edward Albert, who, after an agreeable and instructive sojourn in Canada, came to the United States to be hailed as a harbinger of a new era of international peace and prosperity. One may safely assume that the handsome and agreeable young prince, and the more experienced gentlemen of his suite, left these shores with a firm conviction that the ties of amity and common interest between Great Britain and the United States had been really cemented as a result of their visit to us. It is not too much to assume, also, that the distinguished party on board the *Renown* steamed away with a feeling that the Prince had made a real "hit" in this country, and that in the course of his too brief sojourn among us we had learned to have genuine affection for him. In any event, we are glad to assure our English friends that such impressions would quite have been justified.

The Prince of Wales was heartily greeted at Washington, where he was housed in the Perry Belmont residence and received at the White House and taken in tow by cabinet officers and gentlemen of the diplomatic service. The social features of his Washington trip were no doubt agreeable, but he rested afterward in a week-end at White Sulphur Springs, where he golfed and danced and frolicked in comparative privacy. But when he came over to New York for five days he got his real American thrills. He declared himself, with apparent earnestness and candor, that New York was "wonderful" and that he had enjoyed an amazing sort of a time in that metropolis. Some aspects of the Big Town seemed to rather bowl him over—yes, rather, for it's a different sort of metropolis from old London town, no matter whether you view it from the top of the Woolworth tower, or in a box at the *Follies*.

When he arrived he was greeted with cannon, bells, whistles, cheers, showers of paper and ticker tape from the skyscrapers, brass bands, British bunting and flags everywhere, and better still with a show of genuine friendliness from the hundreds of thousands of folk that lined the streets to do him honor. He did many of the things his royal grandfather, King Edward VII, had done when he visited us as the Prince of Wales, but things were different in that faraway year of 1860, for there were traces left of anti-British prejudice. This young Edward Albert, nineteenth of his title, looked into the faces of people with whom he could feel he was binding more closely the Anglo-Saxon ties, and who greeted him as friend and brother in the name of his nation.

He became an adopted citizen of New York, the freedom of the city being granted him as a distinction. In fact, as *The New York Times* put it, "New York and the Prince just took one look at each other and agreed to be friends right off." His first day in the metropolis was a strenuous one but the Prince went through it cheerfully, and just as though he had not been the centre of official functions for months on this side of the water. It was curious to note how the personality of this ingenuous and likable boy "got over" and how quickly the frank curiosity of the people turned to liking.

Lack of space prevents our detailing all that befell the Prince in New York, but the following list will give some sort of an idea of his activities.

Officially welcomed by the City and State at City Hall and made a Freeman of New York. Replied in a speech that made a deep impression on his hearers.

Dined at the Waldorf-Astoria by Mr. and Mrs. H. P. Davison on behalf of the former War Council and associates of the Red Cross. Toasts to the King, the President and the Prince.

Posed for the "movies" and "still" photographers 8,917 times. (Estimate).

Sees New York from the Woolworth Tower. Attends divine service at Trinity, as did his grandfather. Visits Stock Exchange, Sub-Treasury, lunches at Chamber of Commerce.

Sees reproduction of his grandfather's visit on October 12, 1860, to the old Academy of Music in East Fourteenth Street, interior of which had been restored by a moving picture impresario to reflect the atmosphere of the former occasion. Fifteen young women dressed in the style of that day greeted the Prince and in the auditorium were seventeen persons who had attended the earlier historic occasion.

Visits the Horse Show, where he meets Commander Evangeline Booth of the Salvation Army.

Visits New York Yacht Club.

Narrowly misses getting run over by a nerveless New York taxi driver, and grins.

Entertained at a ball and private diversion arranged by Mrs. Whitelaw Reid in her home, where he had a chance to inspect the season's crop of debutantes.

Goes to West Point to visit the U. S. Military Academy, where he reviews the Cadets and lunches with them.

Returns to town and dines on board the *Renown*, having more than a score of guests.

Sees Broadway at night and visits the *Follies*, where he gets a great reception.

Lays wreath on the grave of Theodore Roosevelt at Oyster Bay, and visits Piping Rock Club afterward for luncheon with young Theodore Roosvelt.

Gives reception to thousand school children on board the *Renown*.

Visits the Racquet Club.

Attends dinner of the Pilgrims' Society at the Plaza.

Attends performance at the Hippodrome.

Attends reception at Seventh Regiment Armory given by Mr. and Mrs. Rodman Wanamaker.

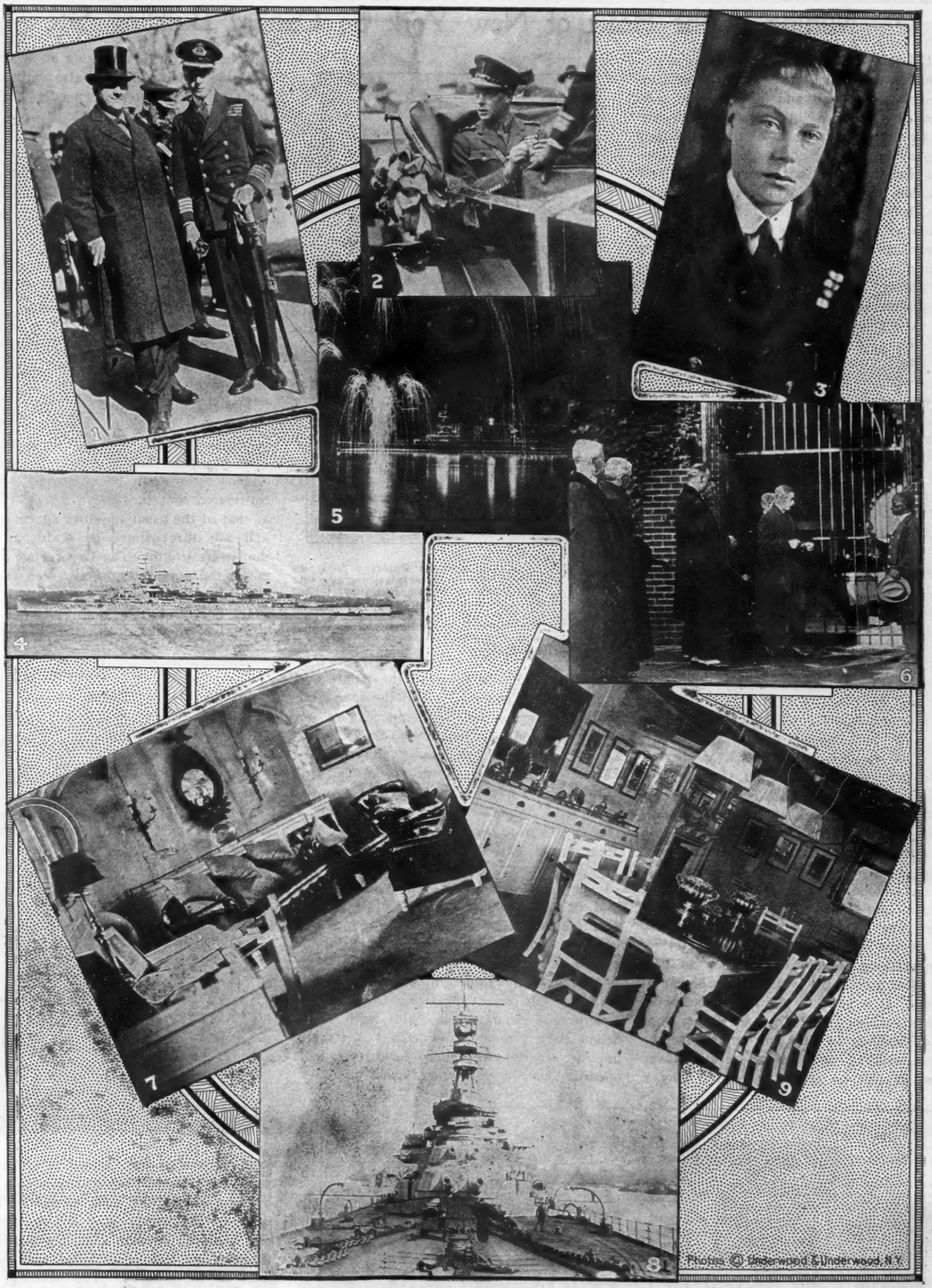
Gives luncheon to Admiral Sims on board the *Renown* and sails for Halifax on his way home to England.

As the visit of the Prince of Wales closed, an appreciation of the welcome extended to the heir to the throne was expressed by Earl Curzon, the Secretary of Foreign Affairs, and cabled to this country. Lord Curzon said:

"England is deeply touched by the warmth of the reception the United States has accorded the Prince of Wales. There could be no surer indication of the depth of real friendship which unites the great English-speaking nations. England has watched the events of the past few days with eager interest and rejoices in this new manifestation of mutual affection and esteem."

KEY TO ILLUSTRATIONS

1.—The Prince and Mr. Josephus Daniels, Secretary of the Navy, at Annapolis, where the Middies were reviewed by the Prince. 2.—The Prince in his automobile passing the offices of COMPRESSED AIR MAGAZINE, *at Bowling Green, New York City. 3.—A "close-up" portrait of the Prince taken at Washington. 4.—An unusually fine view of H. M. S. Renown, floating quarters of the Prince in the Hudson River during his stay in New York. 5.—Fireworks and illumination on board the Renown on the night*

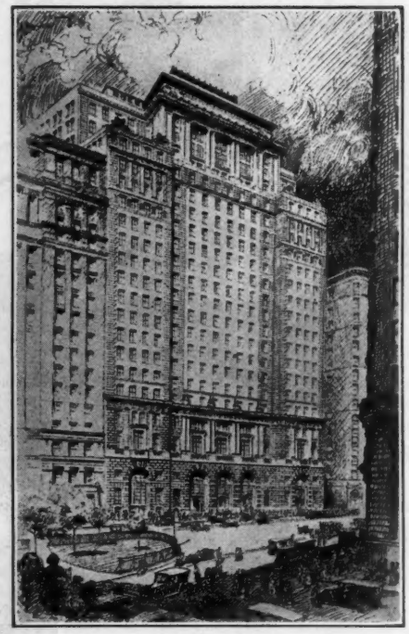


*of Nov. 20, 1919. 6.—**The Prince at the Tomb of George Washington, Mt. Vernon, where he deposited a wreath. He saw a wreath which had been placed there by his royal grandfather, the late King Edward VII.** 7.—The Prince's lounging room on board the Renown. 8.—**Looking into the muzzles of the Renown's powerful forward battery. The Renown, the pride of the British Navy, is the fastest and largest battle cruiser in existence. She has a formidable armament of heavy calibre guns that can shoot about 25 miles, and she has attained a speed of more than 40 land miles an hour.** 9.—**The Prince's dining quarters on board the Renown.***

Mining in the Heart of New York on Cunard Building Site

PRELIMINARY to the erection of a ten-million-dollar skyscraper on a five-million-dollar plot of ground, and following the demolition of a group of historic eighteenth century structures, a first task of the Foundation Company in carrying out its part of the contracts for the new Cunard building in New York, has been a considerable job of mining. Rock drilling and blasting in the island of Manhattan are of course no novelty to the metropolitan dweller, for these operations are required in any underground work, whether for sewers, conduits, subways, foundations or any other undertaking that takes the workman more than a few feet beneath the surface. The island of Manhattan is practically one solid rock, except for a little "made ground" around its lower waterfront abutting on the harbor.

There has been so little new office building construction in New York, however, in the last five years, that the present job of mining down at the beginnings of Broadway, where it starts northward from Bowling Green, has attracted the keen interest of thousands of spectators, who despite earnest urgings from watchmen to "Move on, please," linger about as long as possible, fascinated by the scene of activity 25 to 30 feet below the sidewalk surface, where drilling, blasting, digging, and hoisting with derricks to waiting motor trucks goes forward constantly through the daylight hours.



Facade of the new Cunard Building from an etching based on the architects' drawing. At the left is the Bowling Green Building, where are the New York headquarters of COMPRESSED AIR MAGAZINE. *In the left foreground is part of Bowling Green Park, surrounded by a section of the old, soft wrought iron fence erected more than a century ago.*

For weeks the surrounding buildings in Broadway, Bowling Green and Battery Place have reverberated with the boom of dynamite blasts and echoed to the noisy clatter of air drills. As we prepare this article in the adjoining Bowling Green building, thirteen stories above the street, desks frequently shake and shiver from the shock of the blasts set off only a score of feet from the north wall, but as the walls of skyscrapers are not sustaining walls, no one pays any attention.

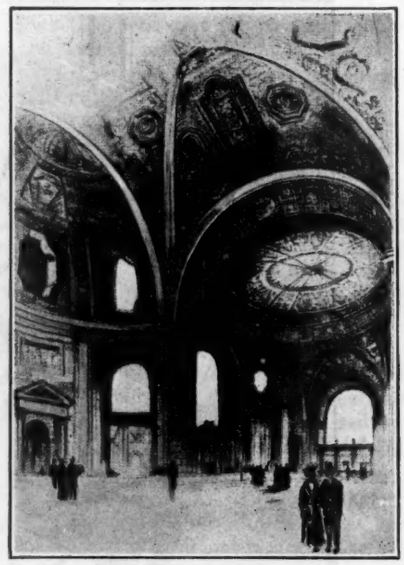
In the October number of COMPRESSED AIR MAGAZINE the Cunard project was described briefly; our present purpose is to set forth some of the details of so highly interesting an undertaking, which is beginning to take form after two entire years of architectural planning. It is not only the largest construction job in New York City since the stoppage of building in 1914, but is likewise the greatest building and realty operation ever essayed in this or any other country by a shipping firm. We show on the front cover of this issue a general view of the foundation work in progress, this photograph having been taken at noon on Wednesday, November 5. Our photographers clambered with their apparatus to the roof of an Italian tenement building on the westward side of Greenwich street and "shot" across the elevated railroad structure toward Broadway. At the extreme right is the wall line of the Bowling Green building, which houses the executive offices of the Ingersoll-Rand Company, the mining and air compressing equipment of which corporation has been eating out the gneiss rock of Manhattan in preparing the way for the concrete and steel.

The Ingersoll-Rand equipment used on this "mining" job consisted of two Class ER air compressors mounted on skids with short-belted electric motors; two Class A straight line air compressors; three Jackhamer drills operating on air from compressors and three piston steam drills operating on steam from a portable boiler. There is also one compressor built by the Chicago Pneumatic Tool Co. on the job. Our illustrations will show how the rock was drilled and blasted out.

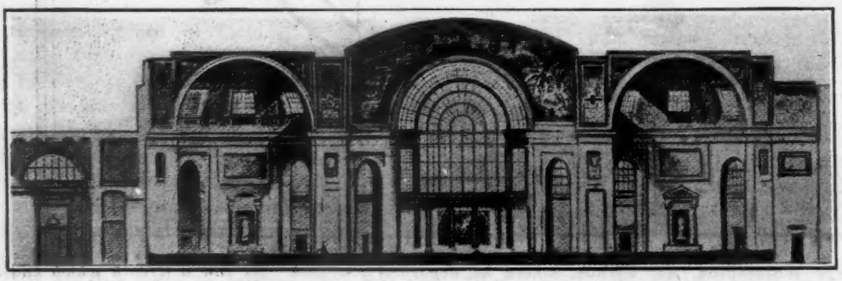
It was an unusually interesting piece of work, even for the laymen, as the photographs indicate. With the approaching completion of the foundations there will quickly appear the structural steel mounting skyward. The steel frame planning for this building contemplated some unusual problems, as will be apparent in considering the requirements for Great Hall, which lofty room, the largest, probably, for commercial purposes in the world, will be 65 feet in height, 185 feet long and 74 feet wide. This room is to quarter the passenger and freight offices of the Cunard.

The chamber called Great Hall compares in size with a church or large auditorium and is also comparable to the main room of a railroad station. The dimension figures given will be more easily comprehended when it is considered that they mean a height as great as that of the usual six-story apartment house, and are three times its width and nearly double its length. The Great Hall alone will cover the equivalent of six New York City lots. It will occupy the greater share of the grade floor and the next three stories above.

The New York and principal American headquarters of the Cunard Steamship Company, Limited, will be housed in this 21-story business palace, for such it will be in every sense of the word. It will also contain the offices of the Anchor Line, the Anchor-Donaldson Line and other allied and subsidiary lines of the Cunard. The building, we are advised, is to be ready for occupancy by May 1, 1921, but if building conditions meantime should again approach normal, there is a



Perspective view of Great Hall, new Cunard Building, as it will appear when occupied as the passenger department of the Cunard Line.



A longitudinal section of Great Hall, new Cunard Building, which in magnificence of treatment and spaciousness will eclipse any other business room in New York.

Photos by COMPRESSED AIR MAGAZINE Illustration Service

Fig. 1—General view of rock drilling operations close to wall of adjacent Bowling Green Building. Fig. 2—Close-up view of Jackhamer rock drill of which a number were employed on the work. Fig. 3—Near view of rock face showing depth of cut after earth overburden had been removed.

possibility the structure may be completed by next October.

Provision has been made in the plans for the housing of a bank at the Broadway and Morris Street corner. This has been made a complete unit separable from the rest of the building, with private elevators to the fourth floor and safe deposit vaults in the basement.

The new building regulations of the City of New York are responsible for the terraced effect to be seen in the illustration above the eighteenth floor.

The location to be covered by the Cunard building is of peculiar historical interest. Across Morris Street, a few feet to the north, were erected the first white habitations on Manhattan island, when Capt. Adrian Block built four huts to house the crew of the *Tiger* during the interval between the burning of that ship and the building of the *Restless*. With the buildings adjacent to the south, the Bowling Green building and the Washington building, the Cunard building occupies the site of the first Dutch city of New Amsterdam. At No. 1 Broadway, under the Washington building, is the site of Kocks tavern,

British headquarters during the Revolution.

Where the Bowling Green building now stands at No. 11 Broadway, was for many years, the well-known Atlantic Garden. Bowling Green, upon which the Cunard building faces, was for two centuries the social center of New Amsterdam and of New York. It still retains in part the hand-wrought, soft iron railing put up over a century ago.

Bowling was played for centuries in the Low Countries of Europe, but it attained its greatest popularity in the United States, where it was introduced in colonial days from Holland. The Dutch inhabitants of New Amsterdam, which later became New York, were much addicted to it, and up to the year 1840 it was played on the green, the principal resort of the bowlers being the square just north of the Battery and still called Bowling Green.

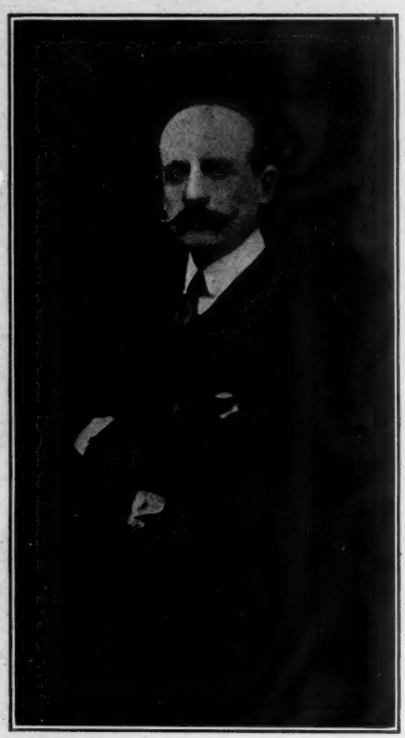
At No. 3 Morris Street in a dingy, worn house which had been for several years a boarding house for Bulgarian immigrants, once lived Aaron Burr when that gentleman was water commissioner of the City of New York. The Stevens House on the Broadway and Morris Street corner was for a long period, especially during the decade immediately preceding the Civil War, the fashionable hotel of the city. Its register during that period read like a combined Who's Who and Social Directory. It had existed in its last form since 1846 when it was remodelled by the original Charles Delmonico and for many years housed his restaurant.

As one commentator remarks, to the person interested in the sentimental and historical aspects of New York City there is something peculiarly fitting in the rescue of this piece of land from the makeshift, slatternly uses to which it had descended in the last generation and in the erection thereon of a building which will not only be a model skyscraper but which will have an historical interest of its own as the largest building ever erected by a steamship company, and the first of great consequence to be built in this country by a British steamship corporation. F. J. T.

THE INDUSTRIAL MISSIONS AND M. SCHNEIDER

THE INDUSTRIAL missions sent to the United States by Great Britain, Italy, Belgium and France to attend the International Trade Conference in October, were entertained in New York City the last week of November. The missions were received and welcomed by the Merchants' Association of New York which organization acted as hosts to the distinguished visitors. Several Cabinet Ministers were included in the personnel of the four missions, the visit of which to this country was designated as "an event of the highest commercial and industrial importance."

From Grand Central Station the missions were conducted to the Hotel Commodore. Thereafter they visited City Hall, which during and since the war has been the scene of so many historic events. Mr. Homer L. Ferguson, president of the Chamber of Commerce of the United States, addressed a luncheon for the European industrial leaders at the Hotel Pennsylvania and speeches were also made by spokesmen for each of the missions.



M. Eugene Schneider, "The French Schwab"

Monsieur, President of the Iron & Steel Institute, Honorary President of the Comite des Forges de France.

The guests later attended the Horse Show, went to West Point, attended a performance at the Capitol Theatre, the largest playhouse in the world, saw the Hippodrome show and inspected the large and model mechanical plant of *The New York Times*. A farewell luncheon was given for the guests on November 25 in the beautiful building of the Chamber of Commerce of the State of New York, at No. 65, Liberty Street.

Mr. William Fellowes Morgan, President of the Merchants' Association, was chairman of the committee which had charge of the reception and entertainment of the European business men and other members of the committee were: Messrs. George F. Baker, Vincent Astor, Lieut. Gen. Robert L. Bullard, August Belmont, Otto H. Kahn, Judge Elbert H. Gary, John D. Rockefeller, Jr., George W. Perkins, Charles M. Schwab, Frank A. Vanderlip and Albert H. Wiggin.

We unfortunately have not the space to go into the details of the international business convention which was held at Atlantic City, which were in any event covered fully in the daily press at the time, but we were glad to observe that it reflected sanity and conservatism. Bolshevism, its scope, the ruin it has wrought, and a determination to crush it forever, became the all-absorbing topic of the convention. While it was evidenced that radicalism was nothing to be lightly regarded or to be trifled with, the delegates declared they were optimistic for the future. They expressed the belief that America and the allies, together with restoration of economic balance, could foil the propaganda.

M. Eugene Schneider, who is known as "the Schwab of France," declared what the United States Government has been able fully to verify, that there had existed a Bolshevist plot, the network of which covered the whole world. "Their avowed plans," he stated, "are to set the world ablaze in order to realize their crazy plans. Because Bolshevism can prolong its existence only by spreading to other countries, Lenin has sent out into the world numerous agents well equipped for their nefarious propaganda."

M. Schneider is the premier steel merchant of France. The immense steel mills which he heads turned out most of the heavy artillery used in France against the Germans. In his address he indicated convincingly that Europe is a "sick continent" and he made a strong appeal for close coöperation between Europe and America in getting the world back on a sound economic and political basis.

The Schneider industries, with the famous plant at Le Creusot most notable among them, stretch across the whole reach of France and ramify into England, Belgium, Italy, Russia and the United States. It was a mission formed of engineers of the Schneider Company which brought the secrets of French steel making to this country in 1915. The firm's associations with America have been close ever since then. M. Schneider declared that his country had now taken heart of grace for the future and assumed its manifold tasks courageously.

M. Schneider, whose portrait we herewith present through the courtesy of a French contemporary, is a grandson of the Joseph Eugene Schneider who founded the family industry at Le Creusot early in the last century, beginning the family fortunes and fame by purchasing the old royal iron foundries, which had been built at Le Creusot in 1782 under the patronage of Louis XVI. The foundries have furnished the cannon for France from that day to this.

M. Schneider was twice honored by American institutions. He received the degree of Doctor of Engineering from Stevens Institute, Hoboken, and also received the medal of the Mining and Metallurgical Society of America.

M. Schneider is the first foreigner to receive the Mining and Metallurgical Society medal. It is the sixth medal awarded by the society. The first medal was awarded in 1914 to Mr. and Mrs. Herbert Hoover for their translation of "De Re Metallica," a technical work written in Latin.

Charles M. Schwab, Dr. Henry M. Howe, Bradley Stoughton, and Col. Manus McCloskey were speakers at the dinner at the Biltmore, at which the medal was awarded. H. H. Knox, president of the society, was toastmaster.

Dr. Alexander C. Humphreys, President of Stevens, conferred the scholastic degree upon M. Schneider. Representatives of the faculty and of five engineering societies were present at the ceremonies.

All-Concrete and also Frame Houses for the Comfort of Industrial Employees

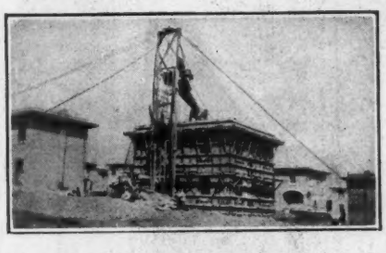
AN INDUSTRIAL housing project of more than ordinary interest and importance, one which has attracted more interest in the technical press from its physical side than from its social side, is that sponsored for its factory employees at Phillipsburg, N. J., by the Ingersoll-Rand Company of New York, through what is known as the Phillipsburg Development Corporation, of which Mr. Paul R. Smith is the Vice President and general manager in active charge of operations.

A careful inspection made by the writer of the Phillipsburg Development project seemed to point to the conclusion that it had been worked out after consultation with the National Housing Association, but we do not know that this was the fact. In any event, modern, sanitary and comfortable homes of enduring permanence in cheerful and happy surroundings have been provided along the lines highly approved by the housing authorities of the country. One would think that the advice contained in the book by Mrs. Edith Elmer Wood on the housing of wage earners, recently issued by the Macmillan Company in New York, had been closely followed, but as a matter of truth the housing project at Phillipsburg was worked out and put into effect long before the book was published. A review of that volume appeared in these columns last month.

Two separate tracts of land, one known as "Valley View," and the other as "Hill Crest," have been utilized by the corporation as building sites, both having been chosen happily as to accessibility, without proximity, to the industrial plants from which the owners and tenants are derived, and also selected in high rolling ground with good drainage and commanding beautiful views. These desirable fundamentals have been lacking in several other housing operations we have inspected that have been classed as "high grade."

The pictures accompanying this article will really tell the story at Phillipsburg better than mere words can do it, but we propose to furnish to industrial executives some figures and facts that have not heretofore been made public. Nearly all of the houses at Valley View are of concrete and fireproof and built as "permanently" as anything in the way of habitations can be built. At Hill Crest the houses are of brick or frame construction, with concrete foundations and porches, and cost more.

The monolithic concrete houses are poured in forms of the C. H. Ingersoll system and are erected under the personal supervision of Mr. Paul R. Smith, previously mentioned, who is a landscape architect and town planner. The Valley View six-room frame houses on 40x100 foot lots rent to Ingersoll-Rand employees at $18 a month or sell at $3,000, approximately. They contain a living room, or "parlor," and diningroom and kitchen on the first floor and upstairs have three bedrooms and a modern bathroom with sanitary plumbing. There is a basement the size of the house and concrete foundations. Three sets of forms are used to pour 25 foundations, the forms in interchangeable bolted sections being built by the development company. The hopper has an opening the size of a wheelbarrow, and no concrete is lost.



Showing how houses were "poured" in the C. H. Ingersoll molds

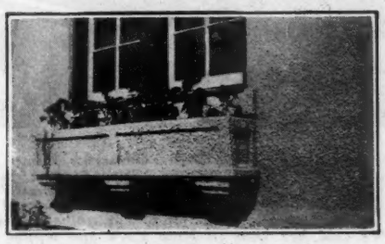
These houses are of regular frame construction, with siding, and having slate roofs. A hot air pipeless heater is used. There is a dresser in the kitchen and a closet in each room. Houses of this character on 50x100 foot corner lots bring $200 more.

The four-room concrete houses at Valley View, with full basement, on 40x100 foot lots, rent to employees at $16 a month and sell at $2,750. The first floor contains a combination diningroom-kitchen and a livingroom, and the second floor contains two bedrooms, each with closet, and a bathroom. It should be noted that the prices given in each instance include the cost of grading the lot. In the four-room houses there is no heater in basement, which must be furnished by occupant.

The six-room concrete houses on this development rent for $18 to Ingersoll-Rand employees and sell at $3,250.

It takes from eight to eleven hours to pour, according to conditions. As in the case of the four-room house, all window and door frames, flue lining for chimney, plumbing, roughing and electric light conduits, are in place before the pouring. Unlike the four-room house construction, the front steps and steps leading from the side entrance to the kitchen and basement, are of concrete in the six-room houses, and are poured as the house is poured. The same is true, also, of the porch.

The front door hood is hung after the house is stuccoed. Stucco is applied with hand brooms—about one ton being used to each house. A form is set in place in the floor before pouring, leaving a hole of correct size for the register from the heater.



Detail of concrete window boxes for flowers.

After the six-room form was working properly, a house a week was poured. As to the taking down of forms, a house last poured, let us say, started on Monday; on Thursday night of the same week, another house would have been poured using the same forms. This was regularly done unless bad weather interfered. This means that all window frames and door frames, plumbing, roughing, sub floors of reinforced concrete, electric light conduits, partitions of concrete, roof of concrete, cellar floor of concrete, porch, front steps, kitchen and cellar steps (all of concrete), and the chimney, are complete, when the forms are taken off. About 80 yards of concrete are needed outside the cellar floor, and 2,000 pounds of reinforcing.

It requires about four days' time for a house to dry before the application of water proofing to the exterior walls. Because the walls of the house are furred out, and bishopric board nailed on to receive the plaster, the walls have a continuous air space. The second-story ceiling is hung.

No lots have been sold on this development, except to house buyers, it being the hope of the corporation that the demand for these houses will warrant building on all remaining improved lots, about 100 in number, with unimproved property adjoining and owned by the corporation, containing 40 acres. Only Ingersoll-Rand employees may buy these houses, but any desirable person may rent. The lease is very liberal.

The following plan has been worked out in order that Ingersoll-Rand employees may buy a home for as little per month as one would nominally have to pay to rent. It should be understood that at Valley View one is not compelled to pay anything down on the purchase price, the same holding true at Hill Crest, when one buys a house erected by the corporation from its own plans and specifications.

A purchase example of a $3,000 house follows:

No cash down; $22.44 payment per month, $1,500 to remain on mortgage at five per cent, is $75 per year. Balance of purchase price, $1,500. Part payments with interest per year, $194.25 per year; total, $269.25, which divided by twelve, is $22.44 a month.

This is on the ten-year plan. At the end of ten years, the property is one-half paid for, and unless some money has been paid on the principal, at that time there is a mortgage on the property of $1,500, which the corporation agrees to carry at six per cent.

On the thirteen-year plan the payments are less; for instance on $3,000, $19.60 is paid per month; no cash down; $1,500 to remain on mortgage at five per cent., is $75 per year; balance purchase price, $1,500, part payments with interest, is $160.20 per year; total, $235.20, divided by twelve, $19.60 per month.

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Exteriors and Interiors on the Valley View Development

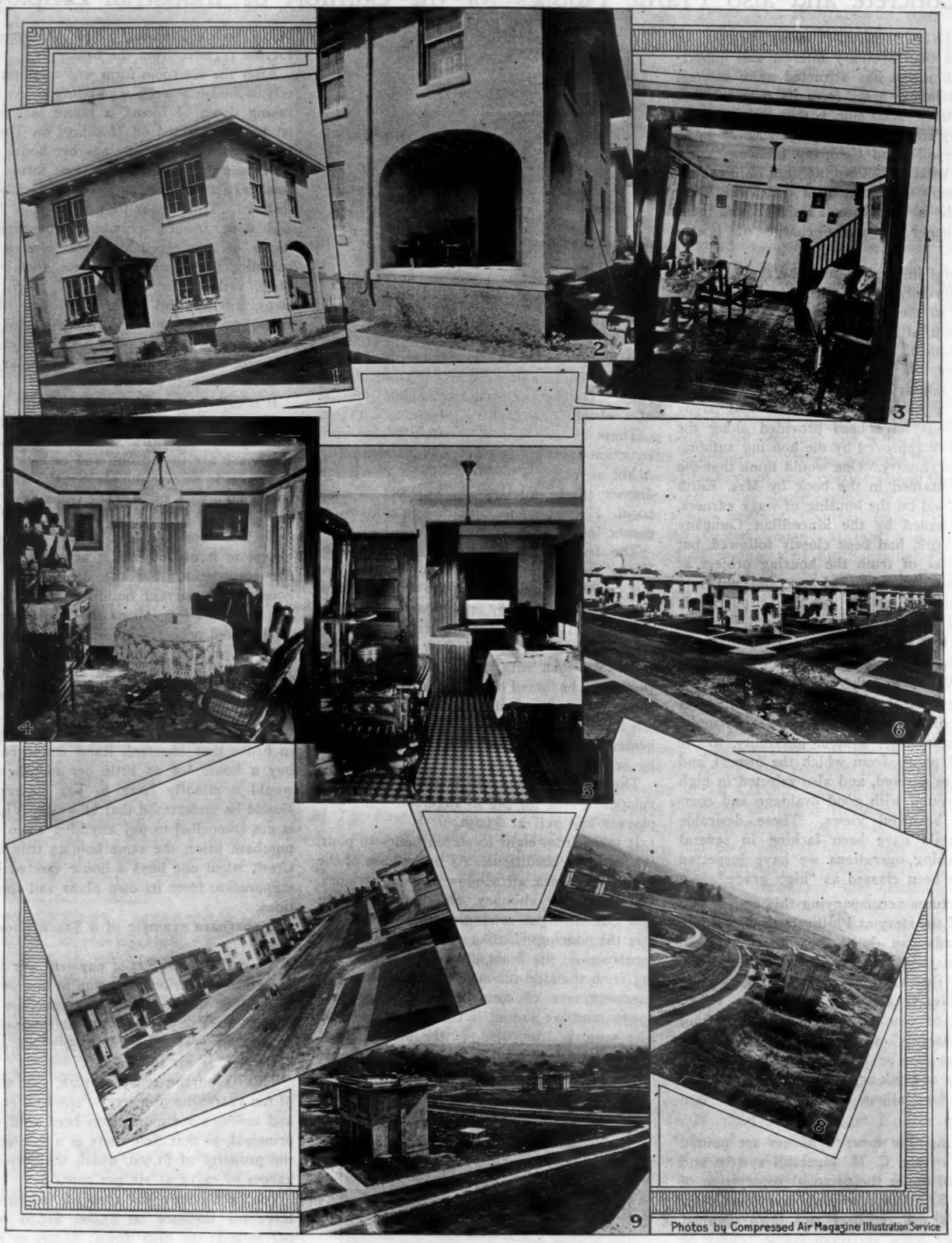


Fig. 1—Exterior of the home of John Wilson, Keeper of the Main Gate, Cameron Pump Plant. Fig. 2—Comfortable back porch of the Wilson home. Fig. 3—Interior of the living room of the Wilson home. Fig. 4—Dining-room interior of Wilson home. Fig. 5—Mrs. Wilson's large and comfortable kitchen, where they have breakfast and luncheon when there's no "company." The door on the left leads down to the cemented basement, where is located the furnace, fuel storage and the housewife's storage of preserved garden produce and fruit. All was immaculately clean and inviting looking. Mrs. Wilson had several hundred cans of fruit and vegetables, several bags of potatoes and onions for the winter and other supplies which she raised in her own garden. We told her that in New York she would be called a "food hoarder." But in her case it was merely housewifely thrift. Fig. 6—A block of "eternal concrete" houses in this spotless town. Note the grading, the macadam pavements and cement walks. Rapidly growing shade trees have been set out. There is plenty of space, air, sunshine and a fine view on all sides. Fig. 7—The nearest approach of industry or business is the smokestack in the distant background, more than a mile away. Fig. 8—At the centre of the irregular plot in the background is to be erected a modern school house. A general store, a "movie" theatre, a physician and a dentist are coming to the community. Fig. 9—Just beyond the two houses to the right a pretty park is being laid out, where there will be shrubs, flowers and trees. All of the vacant ground in this picture and in Fig. 8 will be built up next year.

Pretty Homes of Brick and Frame Construction on the 'Hill Crest' Site

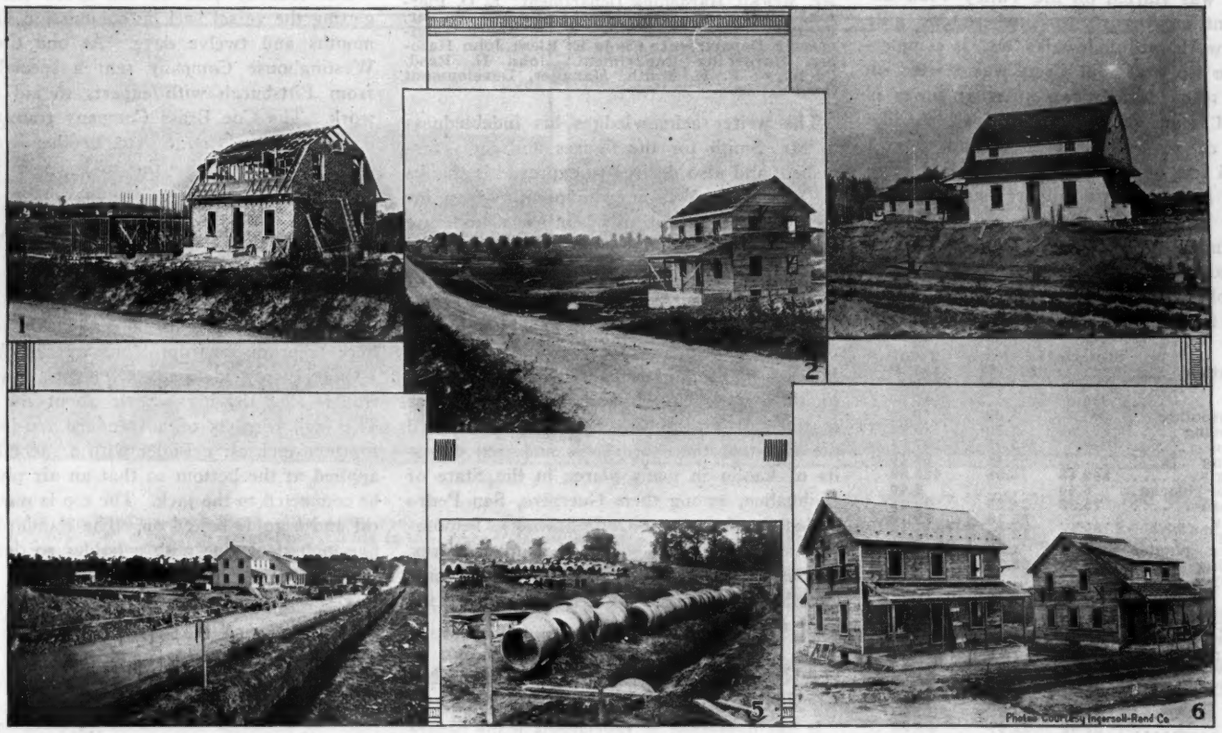


Fig. 1—A house of hollow brick walls in course of construction on a fine road on high ground and commanding a splendid view. Fig. 2—A frame house on the development at Hill Crest. The roadways are all being boulevarded. Fig. 3—A frame house with mansard roof, and beyond a bungalow of brick. Fig. 4—Showing the work of providing sanitary sewage disposal facilities at Hill Crest, a big job in itself. Fig. 5—The main highway leading into the development from the town of Phillipsburg, N. J. The deep trench on the right was dug by a powerful trench-digging machine which did the work of scores of men at much less cost. Fig. 6—Specimens of frame houses, showing porches on concrete base full width of the house.

One-half paid for in thirteen years as explained in ten-year plan.

On first thought one might say, "It takes a lifetime to pay for a house." To grasp the real value of the proposition, one must consider that it costs nothing to enter, that the payments are little more than rent, that one may pay off on the principal each year and decrease his monthly payments; that by each payment he owns a greater equity in the property.

No restrictions are placed on selling a property—except that the buyer must be one agreeable to the corporation; this protects the other owners.

At Hill Crest *no* houses are rented.

It is encouraging to the corporation, Mr. Smith states, that nearly every owner has "paid something down," whether required to or not.

In event of failure to build within the required time, he resells the property to the corporation at the original purchase price. This is done to guard against speculation. However, one may buy two lots outright, guarantee to build on one, and hold the other for speculation.

The corporation will build at cost a house from the purchaser's own plans, on payment of at least ten per cent. down of the estimated cost of the dwelling and lot.

Houses at Hill Crest are six and seven rooms with bath and full basement and one-half the floors are concreted.

They are built of brick, hollow concrete wall (poured, not block) and stuccoed. Frame and gunnite houses are also erected. These houses are on lots with 50 and 60 foot fronts and 130 feet deep, and sell for $4,500 to $5,000 according to size and construction. This price includes grading and concrete walks to the house. Hot air heaters, electric lights and gas connections and fixtures are also provided.

The corporation is developing all its property with good roads, granolithic side walks, sanitary and storm water sewers, and is laying gas line and electric light system and installing the water system. All streets will have six-foot planting strips and shade trees.

The tract is within seven minutes' walk of a trolley, and is only one mile from the heart of the business districts of two cities. Land at the present time is sold to employees at $10 per front foot. No houses may be built nearer than 25 feet to the sidewalk and no house may be erected to cost less than $3,000.

Building materials are bought in quantities, and are stored in warehouses on the ground. Plumbing supplies were bought for 100 houses and there is enough sash, doors, etc., on hand for 50 houses. Window frames and door frames are stored away sufficient for twenty brick houses, and enough lumber, flooring plaster, lime, paint, etc., is stored for 25 houses at the present time. All this material was purchased at a time when the market was low, or from Government operations where material could be purchased advantageously. Mr. Smith said on this subject:

"We are building brick houses at the present time that promise from present costs thus far, to cost not more than ten per cent. more than frame, and then at prices for lumber of last April when we bought costing only $35 a thousand to $40 a thousand delivered. The brick as laid forms a hollow wall. Plaster may be applied directly to the brick, saving the cost of furring and lathing. Fewer bricks are used and the cost of laying is no greater than ordinarily.

"The poured hollow concrete house is an innovation and promises to be a success both from a construction and cost standpoint. The walls are two inches thick—reinforced horizontally and vertically—with interior pilasters every 24 inches and opposite each other.

"There is a continuous airspace five inches wide between the exterior and interior walls. Plaster is applied direct on the inside, and the outside wall is stuccoed. The forms for this wall are of wood and may be used over and over again."

When we visited Valley View, there were 66 houses there, 52 of which are either rented or sold. At Hill Crest eighteen houses were in

various stages of construction. Two had already been sold and tenented.

Work was started on the Valley View development in August, 1918, where one mile of road work, with sidewalks, etc., is completed. The work at Hill Crest was started on June 2, 1919. Nearly two miles of sewer is laid and some of it is operating. A like amount of road is subgraded, and several thousand feet of sidewalk has been laid. The eighteen houses mentioned are nearing completion. Rainy days, totaling six weeks, retarded much of the work, along with unsettled labor conditions.

The following is a cost table of six-room concrete house:*

	Material	*Labor*	*Total*
Excavation	.....	$72.85	$72.85
Water	.....	7.12	7.12
Sewer	$45.00	.....	45.00
Waterproofing ..	10.00	8.60	18.60
Reinforcing	77.65	7.70	85.35
Erection	.....	207.05	207.05
Wrecking	.....	66.45	66.45
Pouring	349.48	76.08	425.56
Spreader blocks.	6.40	.....	6.40
Foundation	75.30	24.36	99.66
Pointing	.....	35.10	35.10
Lathing	31.60	12.50	44.10
Patching plaster	.....	1.50	1.50
Plastering	42.03	63.75	105.78
Chimney	4.41	.....	4.41
Stucco	25.00	52.00	77.00
Clothes posts ...	1.40	.....	1.40
Furring lath ..	21.16	26.01	47.17
Window and Door frames	61.87	7.59	69.46
Porches	3.39	12.06	15.45
Dresser	18.43	5.94	24.37
Hood	13.52	7.47	20.99
Floors	32.80	24.48	57.28
Stairs	33.50	21.40	54.90
Inside trim	51.73	41.25	92.98
Windows	75.21	12.39	87.60
Doors	20.42	13.86	34.28
Nails	5.70	.....	5.70
Sash weights and cord	31.13	.....	31.13
Hardware	14.14	.....	14.14
Outside painting.	.....	9.75	9.75
Inside painting..	26.29	34.50	60.79
Flower boxes—labor and material	12.68	.....	12.68
Plumbing	188.24	61.59	249.82
Heating	90.00	7.13	97.13
Electric work ...	20.99	.....	20.99
Electric fixtures.	30.00	19.50	49.50
Leaders	3.74	2.95	6.69
Cleaning	.....	3.00	3.00
Areaway	1.50	1.90	3.40
Trucking	.....	125.29	125.29
Shrubbery	15.00	.....	15.00
			$2,512.82

Following is a list of Ingersoll-Rand employees who have rented and bought at Valley View from the Phillipsburg Development Corporation:

BOUGHT

Antonio Nesty, House No. 41, September 1, 1919; Louis Goffredo, House No. 45, August 15; Percival Graffin, House No. 51, April 1; James E. Rady, House No. 52, July 1, Cameron; Fiore Franceschini, House No. 54, July 15; Edgar Crocker, House No. 59; September 1; Gilbert H. Stoudt, House No. 60, September 1; Frank Tharp, House No. 61, September 1; Andrew Unger, House No. 62, June 15, Boiler H; Harry Ward, House No. 63, July 1; William Heebner, House No. 107, September 1, Cameron.

RENTED

Aaron Keiper, House No. 15, April 1; Elijah Dalrymple, House No. 18, April 1; William Schmewolf, House No. 20, April 1; Andrew Dobos, House No. 31, July 1; Charles Shauger, House No. 34, July 1; Owen H. Hughes, House No. 37, October 1; William Krickeberg, House No. 39, June 15; Albert Wagner, House No. 48, April 1; J. G. Regitz, House No. 50, July 1; John Wilson, House No. 53; July 1, main gate, Cameron; Thomas Beasley, House No. 55, October 1; Berton C. Brewer, House No. 58, August 15; John Gribben, House No. 49, October 1; Benny Panayewski, House No. 119, September 1; John Paul's Son, House No. 35, April 1; Mike Vargar's Son, House No. 114, May 1.

NOTE—These costs do not include overhead, improved lot, royalty of $150 per house for forms, or permits.

Owners at Hill Crest:

Patrick G. Moore, Cameron Plant; W. B. Jones; Russell B. Donnolly, Cameron Plant; Mr. McFall, Hardening Department; E. O. Pierson, Hardening Department; T. W. Turner, Foundry (superintendent); W. A. Smith, Engineering Department; Clyde E. Ries; John Halbing, Hardening Department; John H. Reed, Foundry; P. R. Smith, Manager, Development Corporation.

The writer acknowledges his indebtedness to Mr. Smith for the figures and facts furnished, and also desires to express his thanks to Mrs. John Wilson, who permitted an inspection of her beautifully kept six-room house at Valley View and the taking of the photographs of her home accompanying this article.

FIND KAOLIN IN CHIHUAHUA

Daily newspapers report from Chihuahua, Mexico, that inquiries made by the authorities of the State of Chihuahua under directions received from the Governor, have disclosed the fact that there are large and rich deposits of kaolin in many places in the State of Chihuahua, among them Guerrero, San Pedro de los Conchos (near Ortiz Station), Temosachic and the region south of Ciudad Juarez. In these districts the natives for a long time have been manufacturing crude chinaware for local use.

HARM TO THE "LEVIATHAN" DUE TO BAD HANDLING

It has developed in revelations made before the Society of Naval Architects that the former Hamburg-American liner *Vaterland*, the world's largest ship, which under its new name, *Leviathan*, is to become a part of the fleet of the American Line, was not among the German vessels interned in American ports that were maliciously injured by their German crews. The United States Government took over the *Leviathan* in a damaged condition, it is true, but Ernest H. B. Anderson, a marine engineer, who supervised the repairs to the great craft, declared the damage was caused through the mishandling of the machinery by a not sufficiently expert personnel. Mr. Anderson expressed the belief that the German engineers were in serious trouble with their engines before the ship was laid up at Hoboken.

Mr. Anderson and William H. Mackay, who was the chief engineer of the *Leviathan* on the first trip after the repairs were made, described the nature of the repairs and in answer to a specific question as to how the damage had been done, replied:

"It was frictional heat, generated by distortion, and not deliberate."

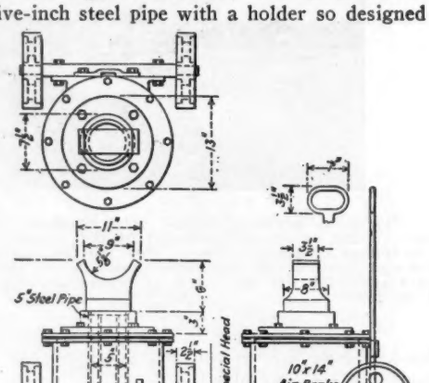
He described in detail the evidences of the futile attempt made by the Germans to repair the giant craft. In one part of the boat they had cut sixteen passageways in efforts to get at the source of the trouble. Rear Admiral Capps, who presided at the sessions of the Naval Architects, asked whether it was faulty installation and operation that caused the damage.

"I should say rather faulty personnel," replied Mr. Anderson. "I am confident now, as I was then, that the ship could have been taken back to Europe in the condition she was in when the United States Shipping Board took it over."

Mr. Mackay told of the speed shown in getting the vessel back in commission in three months and twelve days. At one time the Westinghouse Company sent a special train from Pittsburgh with experts to aid in the work. The Coe Brass Company transplanted its shop from Connecticut to the Brooklyn Navy Yard to make the tools to form the blading for the turbine engine.

AIR JACK FOR LOCOMOTIVE DRIVING WHEELS

The air jack designed by C. W. Shane, and neatly shown in the little drawing which we here reproduce from *Railway Mechanical Engineer*, provides a convenient means of transferring driving wheels about the shop. The jack consists of a standard ten-inch by fourteen-inch air cylinder with a special head applied at the bottom so that an air pipe can be connected to the jack. The top is machined off and a guide bolted on. The standard is of five-inch steel pipe with a holder so designed



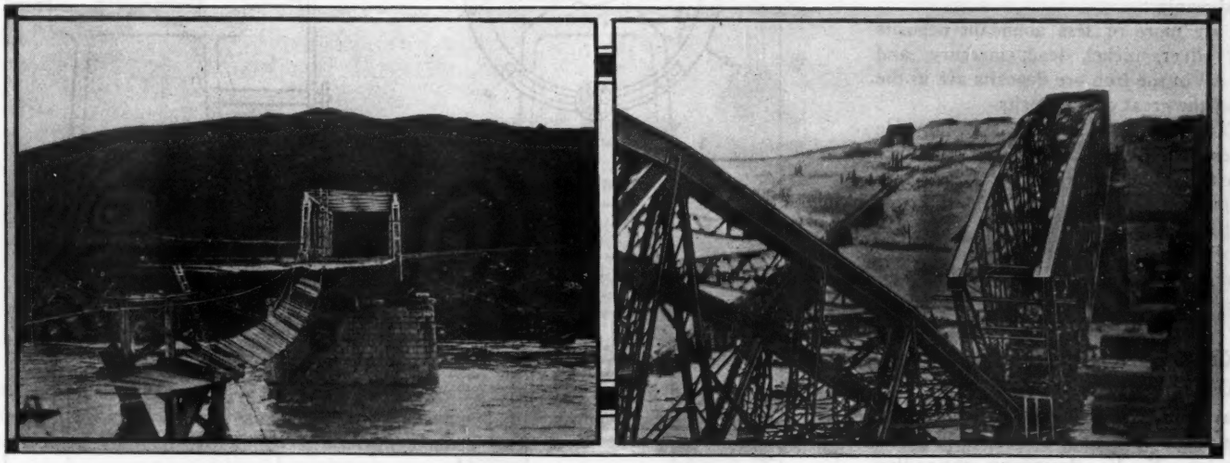
Portable jack for driving wheels

that the pipe and cylinder plunger or piston rod are always in line and act as a pivot. Small wheels, similar to those used on hand trucks, are applied to one side of the jack and a socket is provided for a removable handle by means of which the jack may be moved from place to place.

To transfer a pair of wheels from one track to another the jack is placed underneath the axle with the holder at the center and air from the shop line admitted into the cylinder at the bottom. This raises the plunger, thus lifting the wheels clear of the rails. They are then turned in the desired direction on the pivoted holder, the air pressure in the cylinder relieved, the wheels lowered to the floor, and the jack removed. The wheels may then be rolled to another track, the handle inserted in the socket and the jack moved in position to again raise and turn the wheels as may be desired.

Stephen Crute, who for the last two years has been general manager of the Danbury & Bethel Street Railway, Danbury, Conn., has resigned to take an executive position with the National Acceptance Corporation, Boston, Mass.

Engineering Projects Offered America by Roumania



Photos courtesy of the American Red Cross.

Fig. 1.—Serbia too needs new bridges. The ferry-boat in the background is the only means of crossing the Vardar River. Fig. 2.—Another opportunity for American engineers. This is the general Russian bridge at Kungoor, which was destroyed by the Bolsheviki.

By E. L. BRODNAX

OPPORTUNITIES for American engineers, transportation men, and for American goods from machinery to pins, are unparalleled in Roumania today. Canals must be cut, harbors deepened, bridges rebuilt, railroads constructed, and machinery installed to exploit the vast mineral wealth. American methods and American capital are preferred by the Roumanians who are very grateful for the help extended by the United States through the American Red Cross.

After five years of war the people were in a distressing condition through starvation and sickness. The Red Cross sent into the country twelve shiploads and nineteen trainloads of food, clothing, and medicines, which assisted in stamping out the dread typhus and smallpox.

With plenty of money to spend from this year's grain crop and oil output, Roumania is in a much better financial condition than the other Balkan States and is ready to make a lightning recovery. She is looking to America for aid.

Traffic in Roumania at the present time is very difficult. Most of the principal rail lines are single-tracked and passengers are forced to ride by the hundreds on the roofs of the cars. Even before the war the government was considering installing a double track system between the large cities.

The government is now considering the electrification of the Bucharest-Predeal railway line, which is by far one of the most important in the entire country. The electrical power will be furnished by waterfalls. The French are developing electrical power from the head-waters of the Rhine and Americans have the opportunity of using Roumania's water power in the same way. Old Roumania's possible hydraulic power was an average of 32,268,521 cubic feet of water flowing into the Danube yearly or 1023.23 cubic meters per second. Using 35 per cent. of this water would furnish 500,000 horsepower or in extremely dry years, 375,000 horsepower.

Considering a consummation of 800 grammes of coal per horsepower hour at 25 *lei* per ton, 500,000 horsepower would represent during a year at least 74,000,000 *lei*, which at the present rate of exchange is about $10,000,000.

The southern part of Roumania is practically without transportation facilities and plans are under way for the building of a canal from Bucharest to the Danube. This difficulty encountered by the American Red Cross in distributing supplies emphasized to the government the urgent need of a canal.

There are innumerable streams from the Carpathians to the Danube which would greatly relieve the traffic problem if they too are canalized. The possibility of making the Sereth and Alt rivers navigable is also being considered. Previous to the war the improvement of navigation on the River Pruth was contemplated by a commission of delegates from Austria-Hungary, Roumania, and Russia, according to a recent report from Robert S. Doman, of the American Red Cross Commission to Roumania.

The advisability of deepening the bed of the river was discussed but the delegates from Russia raised strong objections and the idea was abandoned. Another project being considered by the government when war was declared was the building of a bridge over the Danube to connect Roumania with Serbia.

The great bridge over the Danube at Cernavoda must be reconstructed. In many respects this is considered the greatest structure in Europe and it is rumored that the contract for its reconstruction will go to a French firm. This bridge, known as the King Carol Bridge, is 1,260 feet long and 114 feet above high water. One branch of it crosses the Danube at Cernavoda and another at Fitesti. It is the only bridge between Novi-Sad in Hungary and the Black Sea.

The bridge across the main stream is intact but near Fitesti there is a broken section 600 feet long. The viaducts and embarkments between Fitesti and Cernavoda are more than eleven miles long. The movement of oil, grain and all sorts of freight from the sea to the interior of Roumania depends on this bridge. There are eighteen other bridges to be built in addition to the King Carol Bridge.

Mr. Doman says: "Harbor extensions have been made necessary by Roumania's economical growth and the fact that in the immediate future there will be much more traffic between America and Roumania than before the war. American shipping interests should prepare to make use of the Danube, taking an example from the British who plan to enter the Danube countries from the Black Sea to Ratisbon in Bavaria.

"Roumanians are much pleased at the announcement that an American shipping line will soon have vessels plying directly between New York and Constanza and Galatz. The present harbor at Constanza, however, is much too small. During the rough weather last spring the captains of a dozen American flour boats from Seattle, which put in there, were held up for days, for fear of colliding in the narrow basin with other ships or with the sea walls at the mouth of the tiny harbor."

All of Roumania's steel and iron needs could be met if Americans developed her iron mines, and she then would be able to supply the Balkan States. There are vast and very rich undeveloped deposits both in old Roumania and in Transylvania, particularly along the Carpathians.

The iron industry in Transylvania is carried on by seven iron foundries, twelve high furnaces, 26 machine tool factories, and twelve nail, shovel, scythe and agricultural implement manufacturies. In 1912, in the old Kingdom of Roumania, there were 62 mecano-metallurgcial factories with an invested capital of *lei* 26,910,886, using 5380 horsepower, their production amounting to *lei* 37,365,233. This number increased to 82 factories in 1914.

Roumania's re-won provinces, Transylvania, possesses several important copper ore mines,

some of which are already being worked. There are also two copper smelting furnaces in Translyvania.

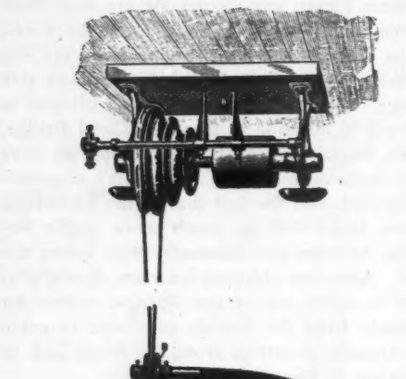
There are more or less abundant deposits of gold, silver, nickel, lead, mercury, and lignite. All of the iron ore deposits are in the vicinity of the great coal deposits.

The Carpathains on the Transylvania side have been thoroughly investigated, and are being partly exploited, while the side facing old Roumania is practically untouched even by scientific investigation.

Tons of modern machinery of almost every kind is needed in Roumania. Why shouldn't it be the "made in America" variety?"

FLEXIBLE SHAFTS RELIEVE OPERATOR OF STRAIN

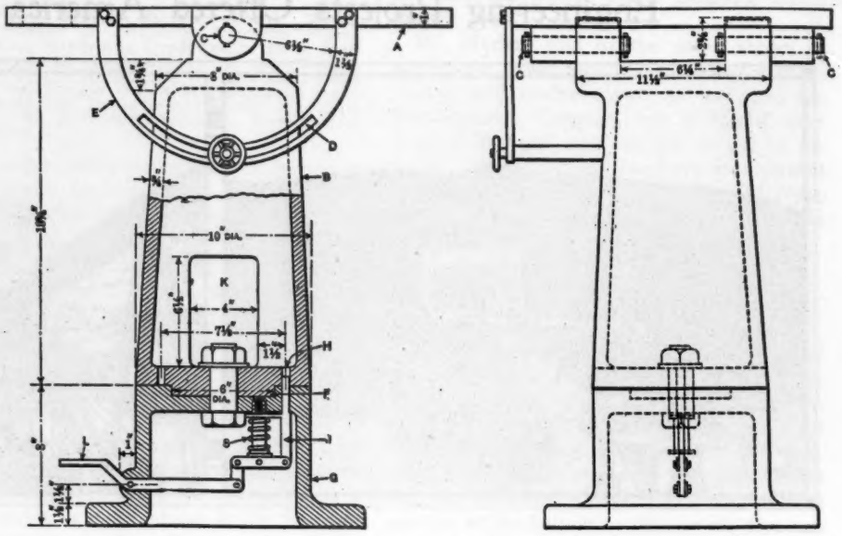
We have received two new bulletins from the Stow Manufacturing Company, Inc., of Binghampton, N. Y., describing their line of motor-driven tools and flexible shaft drives. The latter is an interesting device designed to relieve the operator in processes such as grinding, buffing, drilling and reaming, etc., of the necessity of handling the driving mechanism.



Flexible drilling, grinding and polishing machine, with one shaft and two interchangeable chucks. Changed in the hand while machine is running.

The principle is clearly illustrated by the accompanying drawing, which shows the flexible shaft adapted to driving from the line shafting, and the idea is also worked out in portable motor-driven units resembling a dentist's favorite instrument of torture. At the point "D" in the drawing is attached the grinding wheel, drill or whatever it is desired to use.

"There are fools who kiss and tell;"
Wisely hath the poet sung—
Man may hold all sorts of posts,
If he'll only hold his tongue.
RUDYARD KIPLING.



Air pump repair stand.

SHOP STAND FOR REPAIRING AIR BRAKE PUMPS

THE DRAWING here reproduced from *Machinery* shows a convenient stand for holding air brake pumps or compressors when under repair in railroad shops. It seems to be entirely self explanatory. The base and standard are circular the latter turning upon the former and being located in different positions of rotation by the treadle operated plunger and clamped securely by the heavy central bolt, a large hole K being provided at the side for the use of a wrench. The flat table can be tipped to any angle either way to 45 degrees and clamped by the handwheel. The flat table is provided with sets of holes for bolts to clamp the work. This rig should be a convenience in the shop for many other purposes.

WHAT THE INTERCOOLER WILL NOT DO

By FRANK RICHARDS

I FIND the following in a recent issue of a publication, whose name need not be cited, which has to do with the retail stone cutting trade. It occurs in a somewhat extended reply to a question about the trouble caused by water in operating pneumatic tools.

"In the larger air plants, creating (*sic*) air in capacities of 300 or 400 feet, they have what is known as two stage compressors combined with intercooled systems which go a long way toward overcoming the water difficulty, but in the average small retail plant, using just the single stage compressor, this system would be out of the question."

I of course always strenuously advocate two stage compression, with intercooling and as far as possible the separating and collecting of whatever water may be released, but after all too much should not be claimed for the intercooler as a complete eliminator of the moisture in the air. The simple fact is that under all ordinary conditions where air is compressed in a two stage machine to the usual working pressure of, say, 90 pounds, gage, seven atmospheres, and with the most perfect intercooling and water separating between the stages, the air after the final compression and the cooling in storage or transmission to normal temperature will be not only saturated with moisture but will have also more or less condensed moisture or entrained water carried along with it. While the air is at its highest pressure and its lowest temperature, and before it is used in the tools, all this released water should have a chance to accumulate in some lowest place in the piping or in a receiver near the work, where it can be drawn off from time to time. This would not eliminate the moisture released by the cooling of the air in the act of expansion when doing its work, but the trouble would be so minimized as to be generally negligible, especially when the air is used intermittently.

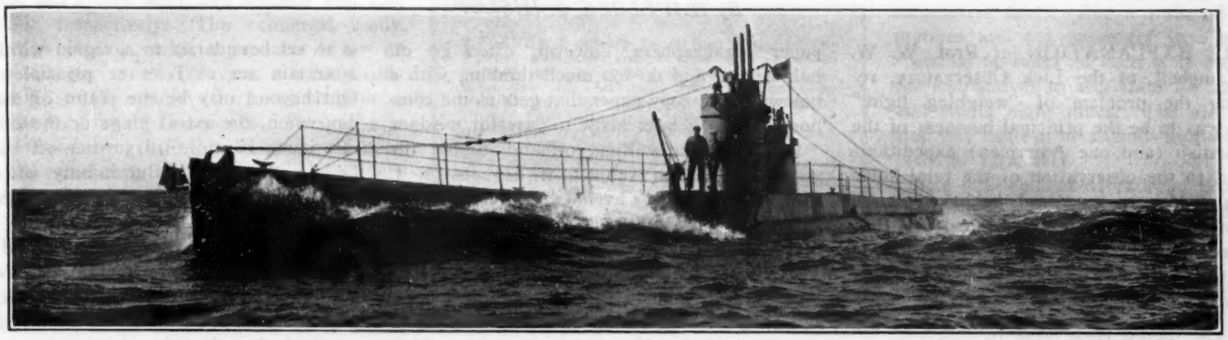
It should not be forgotten that it is the aftercooler and not the intercooler that is the final and effective eliminator of moisture, and it of course is equally applicable in both two stage and single stage compression, but more especially the latter, and it has the additional recommendation that it entails only the cost of installation, and not a constant operating expense.

GYROSCOPE SPEEDS SHIPS

The steamship speed record between Jacksonville and New York has been lowered two hours by use of the gyroscope compass. The inventor, Emil A. Sperry, of the United States Naval Consulting Board, expects that it will reduce the time of transatlantic runs four hours when in general use on liners.

The gyroscope is credited with being the first important improvement in the compass since the Chinese, long before the Christian era, devised this method for determining direction. It enables a navigator to know true north at all times and is not subject to the influence of metal on board as is the ordinary compass. It was used extensively on allied craft during the war.

Air at 3500 Pounds per Square Inch Used on Modern Submarines



Photograph of a Lake submarine of latest type negotiating fifteen knots on the surface.

THROUGH the courtesy of Mr. J. Barraja-Frauenfelder, Chief Engineer of the Lake Torpedo Boat Company, Bridgeport, Conn., we are able to present herewith a photograph of one of the new types of submarines built for the United States Navy by his company, together with some interesting specifications. These vessels have a length of about 180 feet, a breadth of sixteen feet and a draft of about fourteen feet. They displace about 500 tons on the surface and about 600 tons submerged.

Their speed is about fifteen knots on the surface and about eleven and a half submerged. They have a radius of 6,000 miles at a cruising speed of eleven knots. They are equipped with the most modern apparatus including three periscopes, gyro compasses, listening apparatus and wireless.

These submarines carry an armament of four torpedo tubes and twelve torpedoes. In addition they have an anti-aircraft and torpedo boat attack gun of three-inch caliber. They carry a complement of four officers and 30 men and they can stay at sea 60 days without re-supplying.

Compressed air equipment consists of steel air flasks to carry about 200 cubic feet of air at about 3,500-pound pressure for general use and three cubic feet at 1,000-pound pressure for engine starting.

The compressors consist of two units each capable of compressing about twenty cubic feet of air per hour or 3,500-pound pressure, while the engines have their own compressors for starting and injection air.

The air for general use is reduced down from 3,500 pounds to about 200 pounds for emptying the ballast tank, firing torpedoes and other shipboard uses.

The compressors installed in these vessels are of the three or four stage type, vertical, inverted cylinders, and are independently driven by electric motors.

LIGHTNING AND ELECTRIC SPARKING IN MINES

The last report of the Chief Inspector of Mines in India, contains an account of a remarkable explosion of fire-damp caused by a discharge of lightning in the new shaft at the Sitalpur coal mine, belonging to the Bengal Coal Company. The explosion occurred during a thunderstorm, and the evidence showed that a flash of lightning had, to all appearances, passed down the shaft causing disruptive discharges at certain points between the guides and the winding rope, rending the latter at two places situated respectively 228 feet and 278 feet from the surface. The distance between the winding rope and the side of the shaft was 5 feet 4 inches, indicating a spark gap of this width, and an intensity of discharge which could not fail to ignite the explosive mixture of gas and air known to be present in the shaft.

In 1915, M. Ferey described in a paper read before the *Société de l' Industrie Minérale* phenomena of a similar character to the above. In a pit liable to sudden outbursts of gas, for the sake of safety, shot-firing was carried out from the surface. During a storm, in the year 1905, shots went off in two places after the detonators had been connected to the conductors, we read in the *Colliery Guardian*, London. These shots were situated respectively 1,490 and 1,410 metres from the firing station. Realizing the possible danger from this cause, the precaution was taken to cut the conductors at the bottom of the shaft and to connect them just before firing. Even under these conditions a shot went off spontaneously, owing, it is believed, to lightning.

We may, however, travel beyond the comparatively intelligible circumstances of lightning flashes during thunderstorms and consider certain more speculative views respecting the development of electrical conditions possessing elements of potential danger in coal mines. Let us begin with the electrification of dust.

In an illuminating paper, read by Mr. W. A. Douglas Rudge before the Royal Society of London, it was shown that the mere raising of a dust cloud produces a large amount of electricity, the sign of which depends upon the material used. Generally, acid particles become positively and basic particles negatively electrified. Again measurable charges of electricity are produced when particles of quartz, felspar, mica and other substances are rubbed against other particles of their own kind. Thus quartz rubbed upon quartz causes the particles to be positively electrified, and at the same time a negative charge is given to the air. Previously, in 1901, Hesehus had shown in Russia, that pieces of the same material when rubbed together become electrically charged with the same sign, while the dust abraded in the process receives a charge of an opposite sign. These charges are sufficiently persistent to be measurable with a suitable electroscope. Thus a puff of air containing 5×10^{-9} gr. of dust of mercuric sulphide gave a charge to a collector of several volts; while a centigramme of corn-flour, blown into a large room, charged the air to an extent which raised the charge on a collector to a potential of 200 volts, and the effect persisted for some time. The exact explanation of these phenomena is not clear, but the effect seems to be due to surface contact or friction. Neither is it at once apparent in what way these experiments can have any bearing upon pit explosions.

LOCOMOTIVE FRONT END AIR LEAKS WASTE FUEL

Air leaks to locomotive front ends can be readily located when the engines are under steam or when they are located near an outside steam supply by using the blower to create a draft and holding a lighted torch to all seams and joints, advises an executive of the Baltimore & Ohio Railroad in a notice to enginemen.

In superheater locomotives with outside steampipes, leaks are frequently found under the covering of the steampipe where it goes through the sheet. When so located the leak does not show a burnt spot.

Any front end leakage obviously increases the amount of gas and air which must be moved by the exhaust jet, and consequently necessitates a reduction in the size of the nozzle tip. This, of course increases the cylinder back pressure and entails fuel losses. In addition, it frequently leads to partial engine failures and to an increased cost of front end maintenance.

Every motive power official and employe who is responsible for the maintenance of locomotives should see to it that front ends on locomotives are tested for air leaks at frequent intervals.

Human Conceptions of the Mystery of Illimitable Space

By HAVELOCK C. HISLOP

THE EXPLANATION of Prof. W. W. Campbell, of the Lick Observatory, respecting the problem of "weighing light," which was to be the principal business of the two British (and one American) expeditions devoted to the observation of the total solar eclipse of May 29, 1919, was published in the September number of this periodical. At that time we had no news from the solar eclipse expeditions although we forecasted that much interesting scientific data would be made known to the world when the results of the observations were published.

We did not exaggerate the matter in stating that the results of the observations would prove of scientific interest! Scientific brains, voices and typewriters everywhere have been exceedingly busy since the announcements of the Royal Astronomical Society of London came over the cables in November. Dr. Alfred Einstein, Swiss scientist, who in effect "attacked," according to the newspapers, the Sir Isaac Newton theory or "law" of gravitation, even before the results of the solar eclipse observations appeared to substantiate his views, has seen his name bruited over the earth. He and his views have been the subject of innumerable discussions, public and private.

A writer in the *New York Times* rather peevishly declared, that while the Einstein "attack" on the Newtonian law of gravitation had been adjudged successful by many men of science, it seemed "not to be for common folk to undertake a defense of the long-revered formula." This writer exploded with:

> People who have felt a bit resentful at being told that they couldn't possibly understand the new theory, even if it were explained to them ever so kindly and carefully, will feel a sort of satisfaction on noting that the soundness of the Einstein deduction has been questioned by R. A. Millkan in a paper read before the National Academy of Sciences in session at New Haven.
>
> His plausible suggestion is that the starlight passing the sun in eclipse was not deflected by gravitational attraction, but was refracted in the perfectly familiar way of light when it entered and emerged from the gases that form the solar atmosphere. That is understandable as well as plausible, and it is hard not to hope that it is true.

Science in its nature aims to be exact, and we have not been aware that any particle of scientific knowledge available to "common folk" should command a "revered" and blind belief. There are too many uncertainties in science, both in and out of our world, according to our dim understandings, for us to pin our faith too firmly to any natural "law." Especially so when it is under debate and extremely likely to be subject to modification.

Sir Isaac Newton enunciated a great, and probably an enduring principle. The British authorities in astronomy have not necessarily repudiated that principle, but they have proclaimed the results of the solar observations of May 29 last, as "the greatest discovery in connection with gravitation since Newton enunciated that principle," which is vastly different from saying that Sir Isaac Newton was all wrong. "Common folk," like newspaper paragraphers, however, often go off half-cocked and do too much thinking with a typewriter on copy paper that gets to the compositors and is later made to pass for wisdom.

We would be willing, offhand, to put the views on such a subject of Sir Joseph J. Thomson, formerly Cavendish professor of experimental physics at Cambridge up against those of the writer of the "Topics of the Times" column of so great and important a daily as the *New York Times*, and Doctor Thomson went so far as to describe the new variation of the Newtonian theory as "one of the greatest achievements in the history of human thought."

The observations made apparently prove that the rays of light from the stars are deflected in their passage past the sun, which is in accordance with the theories of Doctor Einstein, but not in accordance with the Newtonian theory. It is declared, as a result, that in the field of philosophical thought, space can no longer be regarded as extending indefinitely in all directions. This, of course, would stump "common folk" and great folk alike. If one went far enough one would re-enter the same ground.

Euclidean straight lines could not exist in Doctor Einstein's space. In fact, one investigator has gone so far as to estimate the radius of space, which he places at 100,000,000,000 times the distance from the earth to the sun, or 16,000,000 light years.

To the layman all this is incomprehensible. Like the problems of eternity and the divisibility of matter, the question of limitless space can never be grasped by the intellect of man. Scientists may offer their explanation, may bring forth facts to prove it, but the thing will remain forever a mystery. Let them measure the radius of space, if they will, but one will still try to visualize what is beyond.

Copernicus and Galileo have freed the world from the restraining walls of a circumscribed universe and have left us an infinitesimal dot in the vastness of space. The researches of Doctor Einstein and the observations of the astronomers can never rebuild the ancient boundaries, even at the distance of 16,000,000 light years. Do what they will the mind of man will reach out into the limitless beyond, as a writer in the *Evening Sun*, of New York, sagely observes.

Sixteen million light years! Light travels, by rough estimate of the majority of the astronomers, at a pace of about 185,000 English land miles a second. To get the number of miles it would travel in sixteen million years all one has to do is to multiply 185,000 by 60, then the result again by 60, then the result by 24, then the result by 365, then the result by 16,000,000. Do the multiplication job and think it over! That may be the Einstein width and length and height of the universe, which this modest mathematician finds to be 9,334,656,000,000,000,000 miles. We are not sure about a fourth dimension!

All science can do to curb the imagination, is to set boundaries to a region within which a certain set of laws or principles prevail. Out beyond may be the realm of the fourth dimension, the astral plane or the domain of in-organic mind. Still further off there may be something else. But infinity and eternity are as intrinsic a conception of the intellect as consciousness itself.

At the London meeting, we read in the press report cabled to *The Times*, there was a large attendance of astronomers and physicists, and among them it was generally accepted that the observations reported were decisive in verifying the prediction of Doctor Einstein, Professor of Physics in the University of Prague, that rays of light from stars, passing close to the sun on their way to the earth, would suffer twice the deflection for which the principles enunciated by Sir Isaac Newton accounted. But there was a difference of opinion as to whether science had to face merely a new and unexplained fact or to reckon with a theory that would completely revolutionize the accepted fundamentals of physics.

The Astronomer Royal, Sir Frank Dyson, described the work of the expeditions sent respectively to Sobral, in Northern Brazil, and the Island of Principe, off the west coast of Africa. At each of these places, if the weather were propitious on the day of the eclipse, it would be possible to take during totality a set of photographs of the obscured sun and a number of bright stars which happened to be in its immediate vicinity.

The desired object was to ascertain whether the light from these stars as it passed by the sun came as directly toward the earth as if the sun were not there, or if there was a deflection due to its presence. And if the deflection did occur the stars would appear on the photographic plates at measurable distances from their theoretical positions.

Sir Frank explained the apparatus that had been employed, the corrections that had to be made for various disturbing factors, and the methods by which comparison between the theoretical and observed positions had been made.

He convinced the meeting that the results were definite and conclusive, that deflection did take place, and that the measurements showed that the extent of deflection was in close accord with the theoretical degree predicted by Doctor Einstein, as opposed to half of that degree, the amount that would follow if the principles of Newton were correct.

Doctor Crommelin, one of the observors at Sobral, who spoke next, said that eight exposures of twenty-eight seconds each were made during the totality of the eclipse. Seven of these plates showed seven stars in each. One showed no stars, owing to the presence of a thin cloud, but gave well-defined images of the inner corona of the sun and of great prominence. Seven exposures of the same star field were made for comparison between July fourteenth and July eighteenth in the

morning sky, the sun being then 45 degrees or more away from it. The results reduced to the sun's limb were 2.08 seconds and 1.94 seconds respectively. The combined result was 1.98 seconds, with a probable error of about six per cent. This was a strong confirmation of Einstein's theory, which gave a shift at the limb of 1.7 seconds. The evidence in favor of the gravitational bending of light was overwhelming, and there was a decidedly stronger case for the Einstein shift than for the Newtonian one.

Though the results were fairly conclusive, Doctor Crommelin said the question of the revision of Newton's law of gravitation was one of such fundamental importance that consideration was already being given to the next total eclipse in September, 1922, visible in the Maldive Islands and Australia.

The effects on practical astronomy, Doctor Crommelin said, of the verification of Einstein's theory were not very great. It was chiefly in the field of philosophic thought that the change would be felt. Space would no longer be looked on as extending indefinitely in all directions. Euclidian straight lines, as we have previously noted, could not exist in Einstein's space. They would all be curved, and if they traveled far enough they would regain their starting point.

Sir Joseph Thomson, summing up the discussion, said:

"These are not isolated results that have been obtained. It is not the discovery of an outlying island, but of a whole continent of new scientific ideas of the greatest importance to some of the most fundamental questions connected with physics."

If the Einstein theory proves that light is deflected and bent by gravitation, the true position of stellar bodies will be confused for a time and they will be found much farther removed from the earth than had previously been calculated, leading scientists agree.

The only knowledge we have of the actual size of the stellar universe is based on the few measured distances that have been established by estimations made in connection with the theory that light travels in straight lines, says Prof. Harold Jacoby, the Columbia University astronomer. And if there are curves in these lines, as Einstein had predicted, these observations will have to be recalculated.

"Probably this will mean that there is no limit to space but only to the distance our telescopes can penetrate," says Professor Jacoby. "The telescope being the astronomer's eye, he may be looking along a curve like a circle and if the instrument can be made powerful enough the observer may be able to look all the way around the complete circumference of the circle and will thus see his own back."

Frank H. Clark, formerly general superintendent of motive power, Baltimore & Ohio Railroad, and latterly a consulting engineer, New York City, has gone to Pekin to act as technical adviser to the Ministry of Communications of the Chinese Republic.

Wonders of the Westinghouse Air Brake

IT SEEMS simply to be our duty to reprint for the instruction and general benefit of our readers, especially those who are not habitual readers (as they should be) of "The Saturday Evening Post," the following appreciation of the air brake by Mr. Parsons, formerly editor of "The Coal Age," and now the prolific writer of the department, "Everybody's Business," in the great Philadelphia periodical. We acknowledge our indebtedness to its editors for their courtesy in permitting reprinting of this copyrighted article in these columns.—THE EDITORS.

By FLOYD W. PARSONS

WHAT is the greatest invention ever made? If this question were put to one hundred intelligent men, how many would name the same thing? Some would point to the printing press; some to the cotton gin; others would name the telephone, the incandescent lamp, the internal-combustion engine, the blast furnace or the airplane. There would probably be as many answers as there are separate and distinct industries.

In this connection let me tell the tale of a common everyday device, one that is lacking in elements spectacular but that serves us modestly and efficiently seven days every week. If in the end the reader doesn't agree that the object of my choice is at least deserving of a prominent place in the industrial hall of fame I shall have to admit that I bungled the job of paying deserved homage to a mechanical marvel that people seldom understand and almost never appreciate.

To-night on your way home from business, when you hear that peculiar ps-s-s-sh of escaping air underneath the car as you are about to stop at a station, just remember that our little friend the air brake is right on the job. When you alight from the train and pass the locomotive which has not yet started, listen to that familiar chug-chug, chug-chug, which tells you that the air compressor is busy ramming up numerous small increments of pressure for the air brake to use later when needed.

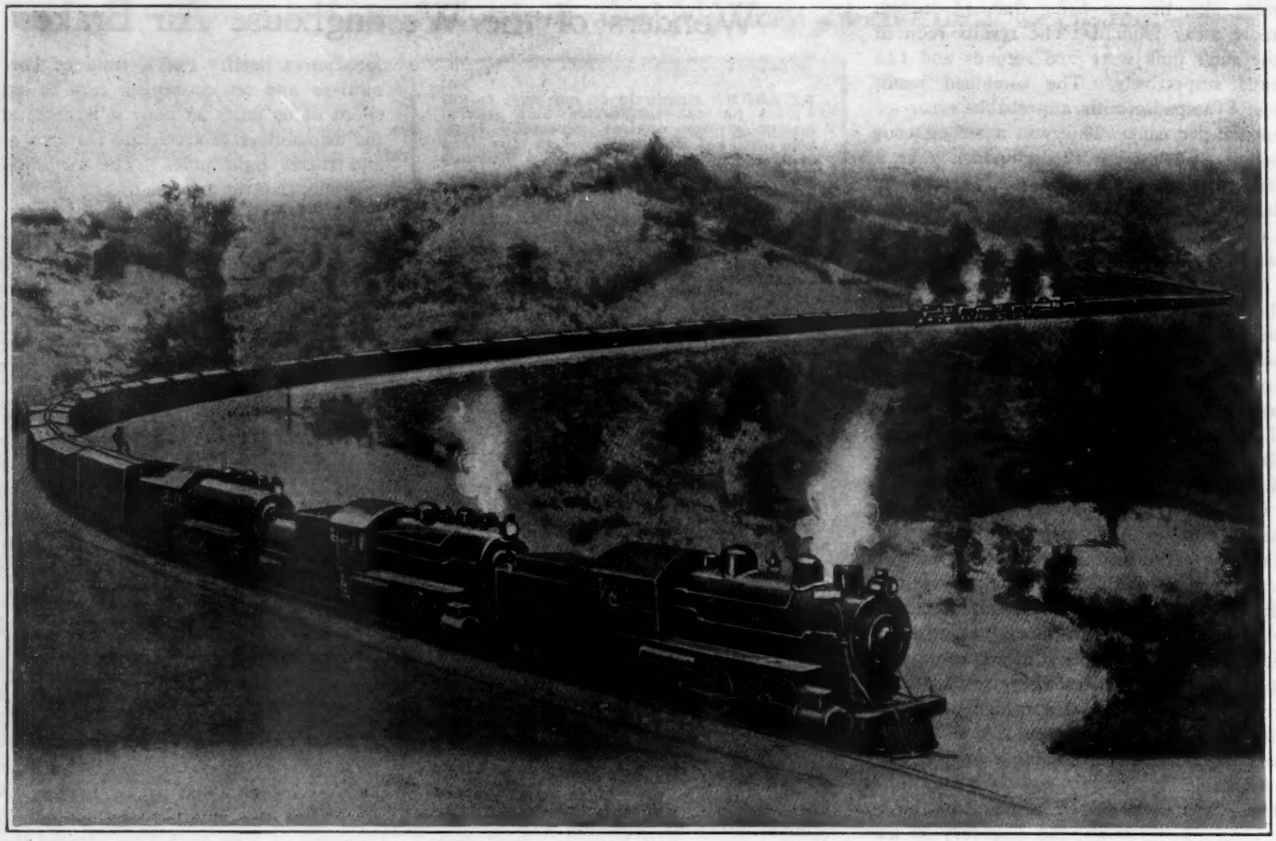
Not one person in a thousand knows how great is the total bulk of the small increments of pressure that are stored away for useful service. Let me try to show what this reserve force actually amounts to. It will bring a modern passenger train to a standstill in a distance of 330 yards when the train is traveling at a speed of 60 miles an hour. This same force if exerted by a modern gun would hurl a 1,000-pound shell a distance of 24 miles. Take, for instance, the *Twentieth Century Limited,* traveling between New York and Chicago. Assume that this train is running on a level track at the rate of a mile a minute. If there were no air brakes and track friction had to do it all, this fast-traveling conveyance would run for approximately six miles before coming to a stop after the engineer had closed the throttle. Almost fifteen minutes would elapse after the power was shut off before the train would stop. Air brakes are more powerful than the modern locomotive itself. For a train of two locomotives and ten passenger cars to attain a speed of 60 miles an hour it is necessary for the locomotives to accelerate for 1200 seconds and travel eight miles. The air brake will stop this train in 21 seconds and within a distance of 1,000 feet.

The development of railroad transportation throughout the world has depended largely upon the ability of the air brake to stop heavy trains in the least possible time. Why do we not travel twice as fast in trains that are twice as long? We have the necessary stretches of solid level track. We can easily manufacture heavier steel rails, and the pulling power of our locomotives has not yet reached its limit. The answer is that the air brake is a limiting factor. To a certain degree civilization follows its development. Without doubt the small body of men who represent the entire profession of air-brake engineering are playing a bigger part in shaping the destiny of mankind than most of us imagine. Progress goes hand in hand with the development of transportation. Railroad efficiency is determined by the size, speed, frequency and safety of train movements, and all these are dependent on braking facilities.

The number of trains a railroad can accommodate is determined by air brakes. A few years ago the Interborough Rapid Transit Company of New York City adopted the electro-pneumatic brake for all its trains, and immediately this company found that it was possible to handle 2,000,000 passengers daily instead of the 500,000 originally estimated to be the capacity of the road. The new brake permitted the use of ten-car trains instead of eight, and allowed them to be run at a greater frequency. The present braking apparatus stops the ten-car train 300 feet short of the total distance required to stop the old eight-car train. This improvement creates a tremendous saving of time and affords a large increase in safety.

Who is responsible for this great drama in our industrial life? Let us, of course, give first credit to the late George Westinghouse, who, back in 1866, got his initial idea while brooding over the delay caused to the train he was traveling on, by a freight-train wreck that had blocked the line just ahead. The prime thought that became implanted in his mind consisted of the idea that no collision would have occurred if the engineers had been able to apply all the brakes at once. This thought took definite form later when Mr. Westinghouse read an article telling how Mont Cenis had been tunneled by using machinery driven by compressed air. This story suggested to the young man, who was then only 21 years old, that compressed air was a force that could be transmitted to any length of train under various atmospheric conditions. A few years later the first air brake was completed and a new epoch in transportation commenced.

A railroad superintendent offered Mr. Westinghouse the use of an accommodation



Train with six locomotives climbing heavy grade, three engines pushing and pulling, three pulling.

train made up of a locomotive and four cars. The air brakes were attached, the train steamed out of the station, and in five minutes the new device had been subjected to an unexpected test. As the locomotive emerged from a nearby tunnel the engineer saw a horse and wagon standing upon the track only a short distance ahead. The instantaneous application of the air brake brought the train to a sudden standstill, a serious accident was prevented and the world had proof of the wonderful worth of a new mechanical marvel.

The Pennsylvania Railroad after a time adopted the new apparatus and other roads quickly fell into line. Contrary to popular tradition, which accredits George Westinghouse with having endured countless vicissitudes in attempting to market the air brake, the facilities of the original company were too limited to fill the early orders that followed this first successful demonstration.

But any one who believes that with the building of the first air brake the big job was finished is entertaining an erroneous idea. The science of air-brake control is still young, and the engineer specialists in this line are still working day and night to satisfy the demands of railroads and electric lines for brakes that will permit still more efficient service. Clever minds are constantly exploring the possibilities of compressed air. Eighteen hour New York-Chicago trains and ten-minute suburban service will be out of date if present dreams materalize. The future will be as amazing as the past if to-day's expectations come true.

However, we cannot measure what will be unless we note what was. The air brake came into being fifty years ago. At that time locomotives weighed 50,000 pounds; now they weigh 600,000. Then we had 9,000-pound cars that would carry 14,000 pounds of freight; now we have 52,000-pound cars that carry a load of 150,000 pounds. In those early days a train consisted of fifteen cars having a total length of 450 feet; now we haul 130 cars in a train 4,550 feet long. The speed of passenger trains was then 30 miles an hour, while now it is 60. Surely these are wonderful changes and they show what a pygmy was the problem of train control in 1869 when compared with the conditions of to-day.

During the fifty years of air-brake history hundreds of improvements have been added to the original device. The recital of how George Westinghouse and his associates overcome dozens of difficult and discouraging problems is a story by itself. The reader should know, however, that each innovation in the art of braking had to conform in principle to the superseded type of brakes. This was always necessary, for the reason that many freight and passenger cars equipped with an old type of apparatus often had to be coupled in the same train with cars fitted with a new model of brake.

One of the earliest problems was that which rose when a train broke apart. There was no means for controlling the rear section. This deficiency brought about the invention of the automatic air brake. The operation of this new device was the reverse of that of the old straight brake. In the latter apparatus the engineer applied the brakes by admitting air to the brake pipe; in the new machine the brakes were applied when the engineer released air from the brake pipe. Consequently if a train broke in two the release of air automatically applied the brakes, and the rear section was brought to a standstill.

But as trains became longer even the automatic brake proved inadequate. It was too slow to act upon the rear cars of a lengthy train, and the result of its operation was a series of severe shocks. This second great problem was solved by using electricity to operate the valves on each car. Then came another marvelous improvement whereby the braking power of a car is automatically regulated by the amount of the load.

To-day the air brake has been so perfected that it is almost human in its operation. Certainly it is too complicated for me to try to describe in a few words. I have already conveyed several thoughts intended to show how important is the part it plays in our industrial life. Let me add that the air brake is responsible for the United States' having the lowest ton-mile rate of any nation in the world. Our records indicate that in 1916 the cost of moving one ton of freight one mile in this country averaged 0.716 of one cent. Long and heavy trains running at high speeds enabled our carriers to secure this low cost. We revel in the comforts of our all-steel Pullman trains, but fail to realize that without braking facilities they would be impractical luxuries due to their heavy weight.

The next time you ride on an electric car or a subway train notice how short, smooth and accurate are the stops. Then fix one thought in your mind: Train control is as vital as tractive power.

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A CEMENT GUN INSTALLATION CURES TROUBLE IN COAL MINE

QUITE a troublesome condition frequently met with in bituminous coal mines is what is known as "buckwheat slate" reef. This is rather more descriptive than scientific, but it conveys the idea accurately. Brok-

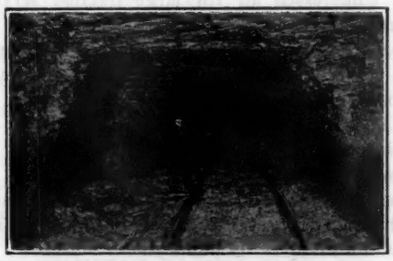

Fig. 1—Entry before treatment, "Buckwheat" on the track

en slate rapidly disintegrates by the action of the air currents and falls continuously in small particles.

To timber against this condition is costly and also ineffective. Aside from the danger, the cost and inconvenience of maintaining men to clean the tracks is obvious, and delays to transportation from dirty tracks is quite a factor. It is seldom that pieces fall large enough to cause direct accidents, but the blocking of the tracks from fallen slate may cause wrecks to locomotives and cars.

At the Cadogan mine of the Allegheny River Mining Company conditions were encountered in the "B" (or Lower Kitanning) seam, through large sections of the mine, which for some time almost completely baffled the mine officials.

A very complete account of how this trouble was taken care of was given by Mr. Fred T. Norman, Chief Engineer of the Allegheny River Mining Company, in *Coal Age*, recently, his narrative with the accompanying illustrations being here reproduced.

At the instance of the superintendent of the mine an investigation of the work of the

Fig. 2—Entry with cement coating

Cement Gun at the Bruceton Experimental Mine was made, with the result that the company decided to give this cement apparatus a tryout. To this end the necessary equipment was purchased and prepared for operations. The outfit comprised the Cement Gun, water tank, motor driven air compressor and receiver, all mounted on rail trucks, with also mixing board and sand screen.

To operate this outfit, six men were employed, as follows: One nozzleman, one gun operator, two attendants to screen and mix sand and two men to prepare the top and sides of the entry. All loose material must be carefully trimmed off before cement is applied to insure a good job. As high as 120 lin. feet of entry have been cemented in one eight-hour shift, but the average run falls short of this, and actually is, by computation of several months' work, 85 lineal feet per shift.

The gunite (or cement and sand mixture) consists of one part cement and three parts sand; it is blown against the rock face which is to receive treatment with about 30 lbs. per square inch pressure. The cement penetrates the small crevices and interstices to a considerable depth and the surface coating of gunite over the rock will average about five-eighths inch thick.

Great care must be exercised to remove all loose and disintegrated material, so that the gunite can get a good grip on solid rock; the necessity of this is easily seen by inspecting Figure One, which shows an entry before treatment. Note the "buckwheat" on the track and the ragged appearance of the slate of the roof and the sides. This entry, however, has not reached the stage where the rock deterioration actually extends over the coal; but

Fig. 3—Junction of two entries after treatment

such would be the case in a short time if the rock were left without treatment. The débris on the track is the accumulation of a day and is an average of conditions met with.

Figure Two shows a view of a main-haulage entry treated with a cement coating which speaks for itself. Figure Three shows the junction point of two haulage entries treated with the cement coating. In this last illustration the tracks are littered with coal shaken off the cars rather than slate from roof or sides.

The Cement Gun outfit at this mine was put into operation Sept. 12, 1918, and worked mostly during night shifts for sixty-four eight-hour shifts, up to the time statistics were computed. During this period 5,482 lineal feet of entry, or approximately 87,700 square feet of surface, was coated.

The average work per eight-hour shift was 85 lineal feet of entry, or 1,370 square feet of surface, covered with a five-eighth-inch thick cement coating. An accurate account of the cost of this work was kept, as follows:

Labor	$2176.03
Sand, 264 tons, at $2.65	699.60
Cement, 502 barrels, at $2.52	1265.04
Total	$4140.67
Cost per lineal foot of entry	$0.7553
Cost per square foot of surface	.0472

The labor costs include: Loading sand, cement and water outside; trimming of entry; mixing sand and cement by hand; the operation of the cement gun; also the training of men for the work.

Up to the present time the cement coating of the entries has proved quite satisfactory and neither breaking of the coating nor signs of slacking behind the coating have been observed in work about eight months old. Thin places will show up in time and must be recoated.

For brattice work the outfit also proves efficient; breakthroughs walled up with rock or slate are given a coating of cement and sand—gunite—which, by the force of the gun, penetrates every little crevice and effects an air-tight and quite satisfactory job.

The Cement Gun equipment can be utilized for many other purposes about the mine. When not in the cement gun service, the compressor is kept busy blowing out motors and generators, operating pick mining machines for entry driving, or furnishing power for air drills or rivet hammers if such work is demanded on a construction job, or special work of any kind.

SHAFT DISASTER IN CORNISH TIN MINE

At Levant Mine in West Cornwall there has been in service for more than 70 years an antiquated device, called a man-engine, for transporting workmen up or down a vertical shaft of considerable depth. In this shaft there is a sliding wooden column 1,800 feet long, suspended from the top and constantly working up and down with a precise travel of twelve feet. There are steps or little platforms upon it spaced twelve feet apart, upon each of which one man can stand, and against the side of the shaft there are similar platforms correspondingly placed so that as the column reciprocates a man can step off or on and wait for the next thus being carried twelve feet at each stroke.

The man-engine was in constant use, often holding 100 men at a time going either up or down the shaft or from one level to another. Recently when the lift was thus loaded the connecting rod broke at the termination of an upstroke and there was a drop which caused the death of 31 men and the terrible mutilation of a still greater number.

Marion F. Crawmer, formerly Chicago manager of the Detroit Twist Drill Co., has resigned to become associated with the Tool Salvage Co., Detroit, Mich., as sales manager.

Beman G. Dawes, president of the Ohio Cities Gas Co., Columbus, Ohio, who has just returned from Europe after a several months' trip with a party of officials of the company looking over the field for foreign business, has expressed the opinion that Belgium will be the first of the war stricken countries to get back on its feet.

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—Founded 1896—

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WILLIAM LAWRENCE SAUNDERS
President

FRANCIS JUDSON TIETSORT
Editor and General Manager

EUGENE P. MCCRORKEN
Managing Editor

FRANK RICHARDS
Technical Editor

WALTER C. LAROS
Circulation Manager

Correspondence invited from engineers, chemists, experimenters, inventors, contractors and all others interested in the applications, practice and development of compressed air. Correspondents and contributors will please submit questions, or matter for publication, accompanied by self-addressed stamped envelope; they also will please preserve copies of drawings or manuscripts as we cannot guarantee to return unavailable contributions in the event of rejection, though our practice is to exercise diligence in doing so.

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Editorials

MARKING ENTRY UPON OUR 25TH YEAR IN THE FIELD

THE FIRST issue of COMPRESSED AIR MAGAZINE was published in March, 1896, and the annual volumes were rectified later so as to make them end with the December issue of each year, for purposes of binding by calendar years. We therefore now enter upon our twenty-fifth year of existence as a technical publication unique in our field, as there is no other periodical in the world devoted to the subject of compressed air and its now manifold applications. We are glad we have justified our foundation and continuance through nearly a quarter century, during the last half of which period Mr. FRANK RICHARDS has been the active managing editor until April 1 of last year, and always in that time our technical editor, and has given the benefit of his ripe experience and his truly remarkable knowledge of compressed air and general mechanical engineering to our readers.

The magazine was founded and published by Mr. W. L. SAUNDERS, who was its early editor. The editorial masthead of the first issue bears also the names of A. E. KENNEY as managing editor, and those of A. NEWTON and J. E. QUINTERO as associates. There have been numerous changes in personnel since, but Mr. SAUNDERS has remained from the beginning its editor-in-chief, invariably scanning all of its contents and making sure that it reflects always his views as far as sound opinion and practice go. He has constantly kept the publication, which has become one of the most quoted technical journals in the world, on a plane of temperate and conservative thought and action; and his alertness is responsible for the present form and character of the publication, which while hewing closely to the lines of the professional and technical field it occupies, is nevertheless kept closely abreast of the progress of industry in a broader sense.

Mr. SAUNDERS has earned the title of Editor Emeritus, while becoming president of the COMPRESSED AIR MAGAZINE COMPANY.

COMPRESSED AIR MAGAZINE now embodies in its text and editorial columns such topics as make it more than merely a digest of compressed air and pneumatic practice, but which comprise also a digest of general engineering and industrial data germane to nearly all the mechanical arts and processes. At the same time it endeavors to be human by touching upon those matters of everyday moment in sociology that affect every worker and executive alike.

We appear with this issue in new guise and form and we trust the change will be wholly pleasing and acceptable to our readers.

The month is also marked by the appointment of Mr. FRANCIS JUDSON TIETSORT as editor-in-chief and general manager of COMPRESSED AIR MAGAZINE, in the course of a reorganization of the staff to carry out our future plans for expansion of the activities of the periodical. Mr. EUGENE P. MCCRORKEN, formerly assistant editor of *Engineering & Mining Journal*, becomes the managing editor. Mr. MCCRORKEN has been an engineering editor for several years and has had an experience that fits him admirably for his new duties in gathering and handling materials required for class periodicals. Mr. WALTER C. LAROS has been designated as circulation manager, with headquarters in the publication office at Easton, Pa.

A COMPRESSED AIR MARE'S NEST IN ITALY

THE FOLLOWING constitutes the substance or the essential portion of a special cable despatch from Rome to *The New York Times* which as an item of current news, or alleged news, it seems to be our duty to lay before our readers.

Under date of Oct. 27 it was stated that "a new invention had been submitted to the Italian State Railways which, if it proved successful, was bound to revolutionize the whole modern conception of communication by rail. It is due to the brains of a young Italian engineer and it is believed that official experiments are now going on, though, naturally, strict secrecy is kept about the invention which, it is understood, already has been patented in Italy and in many foreign countries. Its secret lies in a new system of compressing air by which big central tanks may store enormous power to be distributed to "fuel" stations along the railway lines by strong pipes. Steam is superseded; coal, water power and electricity no longer are needed. Cleanliness, speed and economy will add their advantage to that of keeping the freezing Italian railways from the need for foreign coal.

The inventor claims his system is cheaper and its adaptability to railway systems quicker than any other existing. Steam locomotives can be used almost without changes, only the coal tender must be converted into an air tank. In the new scheme the main expenditure is for the building of big plants for compressing air and the laying of pipes, all of which is said to be vastly cheaper than electrical installation.

A few years ago announcements similar to the preceding were frequent, but in the meantime the possibilities connected with the use of compressed air for large traction service have been very completely ascertained by costly experiment and otherwise, so that there is scarcely a chance of springing any surprises.

The strict secrecy which it is asserted is being maintained concerning the invention or discovery is an absurdity in the presence of the announcement of patenting in Italy and other countries, for the patenting of an invention involves its publication.

Then, again, we are told that steam is superseded, that coal, water power and electricity no longer are needed. It is a sufficient reply to the entire scheme to inquire what new source of mechanical power has been developed for the driving of the great compressors that would be called for.

WHY THEY COULDN'T BEAT THAT STEVENS TECH

THE SPORTING editors and football writers of the East have been unable to "dope" the reason for the Stevens Tech team winning all of its games this year. They have scratched their heads over the phenomenon of a comparatively small school team plunging roughshod and unstemmable through the offense and defense of teams representing larger, though no more important institutions of learning.

Yet the solution is simple. The Stevens team consisted wholly this year, without exception, of men who had been in wartime service. Many of them had been up against the toughest in fighting that the Germans had to offer. When they returned to this country to be mustered out they were as hard as nails, and afraid neither of Teutonic deities, nor men, nor devils. The most strenuous football was as afternoon tea to them.

It was small wonder therefore that they won all their games and that to them was awarded the metropolitan palm as victors, having beaten Columbia, New York University and all other comers on their schedule.

Stevens had the very proud distinction of having 60 per cent. of its entire alumni and undergraduate body in either army or naval service or other war work, a record which is believed to be unparalleled by any other institution of higher learning in this country.

We doff our hats to the engineers of Stevens, and they hail from Hoboken at that!

EXCESS PROFITS TAX SIMPLY A COST PLUS SCHEME

INDUSTRIAL producers and the public alike, have been discovering that one of the chief contributing causes to high prices and living costs in general is the excess profits tax. This tax has proved to be both a burden and a temptation to business. The Federal Trade Commission has taken cognizance of this mischievous situation and one of its members, WILLIAM B. COLVER, has declared publicly that its immediate repeal would be an excellent thing for the country.

Both producers and consumers that really understand the condition of affairs brought about by this tax will quickly agree with Mr. COLVER. Even men of large business affairs who were obliged to work out counter expedients during the war, are as one in declaring that there never was a worse device invented than the scheme of "cost plus," and the excess profits tax is, in its essence, nothing but a cost plus arrangement.

Let us figure it out. Under a cost plus arrangement, say of ten per cent. profit on cost, one can increase his profit by one dollar only by wasting nine other dollars, and we therefore have that curious and seemingly impossible situation of attempting to create wealth by wasting it.

As regards excess profit tax, when a concern has reached beyond what is considered to be its normal inprofitableness, the surplus is partly taken from it by increasing percentages. What follows? Waste and extravagance; or an effort to make as much profit with the excess profit tax in operation as though it were not in operation, and that is done by charging excess profit tax to cost. It means the collection from all the people, when the sixty per cent. excess profit tax rate has been reached, of a dollar, unnecessarily, in order that forty per cent. may be added to divisible profit.

And the excess profit tax or any other tax is not paid by the tax-payer. It is passed on, it must be passed on, in the price of the product to the purchaser of the product, and, as it passes on and on, it grows, like a snowball rolling down hill, until it reaches the public. And the public, whether represented by a railroad president, a skilled mechanic, a farmer, a merchant, a hand laborer, brain laborer, or financier, having had the composite tax bill of all his predecessors passed to him, raises the price of his own labor whether that labor be stored-up labor, in the form of capital, labor of the hands, or labor of the mind, to meet the new cost of living. So, the distressing process having made a complete circle, it starts, again, the endless spiral upward.

Is it not true that the excess profits tax boosts costs, raises prices, halts production, breeds waste, extravagance and inefficient methods of business and raises the cost of living? We are much inclined to agree with Mr. COLVER that this is the case. For the benefit of the whole people we believe the excess profits tax should be abolished.

LETTING BOLSHEVISTS IN AND GETTING THEM OUT

A NATURALIZED American gentleman, born in France, and who combines American efficiency and Gallic temperament in his make-up, returned to New York some months ago and more recently entertained friends in his home one evening and told of his observations and experiences of eighteen months in serving the Red Cross and the French War Office. We may not describe how he did his loyal bit for both America and France, nor may we reveal his identity. In respecting his wishes we honor him for his modesty and for the heavy pecuniary sacrifices he suffered through deserting his large and profitable business. Suffice it is to say he served, and he saw much.

There is no longer any mystery about it, following the raids of the Department of Justice and the finding of incriminating documents and the obtaining of admissions of prisoners who are supposed to be held for deportation, that Bolshevists were sent to this country by LENIN and TROTZKY to organize the job of disrupting the industries of America and also to start a "revolution."

This subject came up in the course of the evening spent with the French-American patriot. We learned that 200 Jewish Bolshevists who had been notorious in Russia and who were skilled agitators and propagandists in the employ of LENIN, had appeared at Stockholm. These Bolshevists appealed to the American Ambassador, Mr. IRA NELSON MORRIS, and with piteous wails and gushing tears assured him they were Jewish refugees fleeing from the horrors of pogroms and assassinations in Russia and that the one desire of their lives was to cross the ocean to free America. They ironically used the word "free," however, it afterward appeared from developments in this country, as a verb and not as an adjective. The kind-hearted ambassador succumbed to their tearful blandishments, they were passed on to the United States, where they had declared wealthy New York Jews would succor them financially, and not long afterward they were turned loose upon us as social wolves, more ruthless and bloodthirsty than any in their native Russia.

We cannot testify as to the truth of the statement that the American Embassy at Stockholm was warned as to the real character of these people. The important fact is that they were permitted to enter this country, that they passed through the hands of both diplomatic and immigration officials. Another branch of our government has recently had to deal with some of these identical Bolshevist persons, no doubt, and we are wondering, just wondering, whether they will be removed from our unsympathetic midst, deported, as readily as they got into this country.

America will be very, very impatient in future with officials or politicians who temporize with or who coddle radicals, whether they be of the firebrand brand, or the parlor brand.

THE INTERESTS OF LABOR AND CAPITAL IDENTICAL

A HOUSE JOURNAL called *Area*, published by a large manufacturer of textiles in England, prints in parallel columns the Nine Rights of Labor, as laid down in the labor section of the Peace Treaty, and suggestions regarding the Nine Rights of Capital, which do not appear in the Peace Treaty, as it contains no capital section. We are glad to reproduce any such thoughts on the subject. Any right-minded man of business affairs will agree to the reasonableness of the Rights of Labor; will the average intelligent workman be less fair in considering the merely suggested Rights of Capital?

The Rights of Labor, as drawn up in the Peace Treaty, follow:

(1) That Labor should not be regarded merely as a commodity or article of commerce.
(2) The right of an association for all lawful purposes.
(3) The payment to the employed of a wage implying a reasonable standard of life, as understood in their time and country.
(4) The adoption of an 8-hour day or a 48-hour week, where it has not already been attained.
(5) The adoption of a weekly rest of at least 24 hours, including Sunday, where practicable.
(6) The abolition of child labor and the limitation of the labor of the young, so as to permit the continuance of their education and proper development.
(7) The principle of equal pay for men and women for equal work.
(8) Any legal standard for conditions of labor to have regard in each country to the equitable economic treatment of all workers resident therein.
(9) The provision by each State of a system of inspection for the protection of the employed, in which women should take part.

The suggested indubitable Rights of Capital are as follows:

(1) That Capital shall not be regarded as predatory and anti-social.
(2) The right of association for all lawful purposes.
(3) The right to a fair profit.
(4) The right to a fair output per week.
(5) The right to good work for good wages.
(6) The right to replace workers by machinery, without opposition from labor.
(7) The principle of higher profits for greater risk.
(8) No regulation nor State control that shall be destructive of the rights of Capital.
(9) The right to use the service of efficiency experts, to increase output and lower costs.

No. 1 of the Rights of Capital should be fundamental in the view of any liberally governed, free-thinking people. Capital makes the wheels of industry turn; it makes production possible. Mere brains, mere brawn alone, will not do it. First costs and protection of initial outlays must always be considered. Capital for enterprises is the result and wage of previous mental labor and of physical labor. Someone had to work with his brain and hand to acquire it and had to practice thrift to save it and make it available for productivity. Surplus earnings of any individual beyond his actual needs in living expense, become fluid capital whether placed in a bank or in securities. All surplus is potential capital. We are all capitalists in some degree, unless we expend every penny we earn in non-necessities, and never attempt

to provide for the future. The laws of economics are inexorable, which is why the theories of KARL MARX and LENIN and TROTZKY are so stupid in attempted practice, entirely aside from their moral aspects.

The other eight Rights of Capital are so obvious as to require no elucidation, no apologies, no explanation as to their soundness in principle. There can be no objection to No. 6, for it has been proven beyond doubt that where machinery supplants a certain percentage of human hands, it so cheapens and increases production and therefore increases bulk profits, that demand for the article manufactured correspondingly increases and makes the employment of more men to operate the machinery obligatory, and at the same time lessens the severity of the toil of each individual worker.

Sane thinkers know that the rights and the interests of Capital and of Labor are identical. He who interposes himself and his selfish arguments between the two is the false friend of either and the enemy of both. He is also the enemy of society and should be dealt with as a serious menace to the peace and security and well-being of any community in which he attempts to propagate his poisonous, noxious "doctrines." The more quickly Labor and Capital clasp hands with true understanding and friendliness, each with a more sincere regard for the undoubted rights of the other, the sooner will our most vexatious social difficulties disappear, as does the morning mist before the rays of the rising sun. We believe that out of the present sporadic "unrest" will come such an understanding.

THE AGE OF CHIVALRY IN MANHATTAN ISLE

A LADY of our acquaintance tells the story of how a pale young man on crutches, in cits clothes, but wearing a service button, entered a Broadway surface car in New York, bound uptown. There were no unoccupied seats. The car jerked violently, as all Broadway cars do in stopping and starting, and not being able to cling to a strap or hold on to a seat, the ex-soldier boy had a hard time maintaining his balance. Men sitting near him and comfortably ensconced in seats reading their evening newspapers paid no attention to him.

A keen-eyed woman who was not immersed in a convenient newspaper, as were the men, saw the button and read with sympathy the drawn face and its occasional tinges of pain. She quickly arose, bowed and smiled and begged him to take her seat.

"Oh, madam, thank you so much—but I couldn't take it," stammered the embarrassed youth.

"Indeed you must," she replied. "I can see you are just out of a hospital. Any boy who did what you did for his country, and for me personally, is more than welcome to such a trifling thing as my seat. You have earned all the comforts and courtesies that I or anybody else can show to you."

The boy hobbled to the seat and took it gratefully, satisfied by the look of comprehension in the eyes of the woman.

The other men seated nearby were by this time so buried in their newspapers that they were oblivious to the world. Even their faces were hidden.

The boy smiled a wan, far-away, Flanders fields sort of a smile. The lady stood until she reached her destination a mile further uptown. The male newspaper readers continued to read and read and read.

VIEWS OF B. C. FORBES ON "PLAYING THE GAME"

AMERICA'S most popular and widely read weekly magazine has made deservedly famous a large group of typically American writers in the last decade, among whom is B. C. FORBES. Mr. FORBES writes entertainingly and convincingly on business topics and always with a heavy accent on the attributes of success. He now writes for his own magazine, in which we have noted of late some of his beatitudes on the game of business, which is as much of a game, he declares, as golf, or baseball, or football.

Life itself, our authority observes, has aptly been likened to a game. To win, to earn and enjoy the fruits of victory, you must play fair. He then goes on to say:

> A cup or medal or other trophy is not the real prize the victor receives; the real prize, the real reward, is the satisfaction derived from superior, worthy achievement.
>
> Wealth is not the real prize of life, it is only a trophy, a symbol, and may carry with it no satisfaction; indeed it does *not* carry with it genuine, lasting satisfaction unless it has been won fairly, honestly, honorably.
>
> The more I see of rich men and the closer my insight into the workings of their minds and hearts, the more strongly convinced do I become that great wealth is no passport to happiness nor proof of true success.
>
> It is an old truth, but it needs preaching every sunrise, so many do not know it, or, knowing it, do not heed it. If they could only be made to understand, if they could only see things in their true colors, if they could only peer into the hearts of many millionaires, they would order their lives more rationally and enjoy life more thoroughly.
>
> To win out you must play the game every time.
>
> "Look at So-and-So; he has everything he wants, yet everybody knows that he made his money by shady practices," you may reply.
>
> Don't fool yourself that So-and-So has everything he wants. Do you imagine that he doesn't know how you and other people regard him? And do not think for a moment that he enjoys being looked at askance, or that he wouldn't exchange most of his ill-gotten gains to stand high with you and other people—and to stand high with himself.
>
> There have been wholesale efforts to reap more than has been sown, to get more than has been earned, to tilt the scales unduly.
>
> Sooner or later the profiteers and labor slackers will get their just reward.
>
> The call is for the fellows who can be depended upon, under any and all circumstances, to play the game.
>
> The things that count are the things that last.
>
> Playing the game lasts.

We wish for our friendly readers in the industries throughout the world a New Year that shall be filled with peace, contentment and increasing prosperity.

AIR-HOLE PROFITEERING.

The profiteering baker now
Exacts his extra toll;
He's skimping on our crullers—wow!
By cutting down the hole!

J. W. L.

Book Reviews

OFFICE MANAGEMENT, Its Principles and Practice. By Lee Galloway, Ph. D., Professor of Commerce and Industry, New York University; Secretary National Association of Corporation Schools; Educational Director of the National Commercial Gas Association. 701 pages. Illustrated with photographs, and indexed. Third printing. Price, flexible full leather, $6. New York, The Ronald Press Company.

MANY very large concerns pay mighty little attention to the subject of office management, and, as a result, there is much overlapping of work and duplication of effort, in addition to wastage of time, materials and money. "Plain common sense," that standby of the old-fashioned business man, is not all that is requisite in running an office, be it large or small. Common sense, in the first place, is a relative term, and what one person may think to be that prized commodity may not coincide at all with another's conception of it. In any event, it does not take the place of expert intelligence and new, but thoroughly proved, ideas.

There is a good deal of sob over system and efficiency and all that sort of thing in modern conduct of business literature, just as there is a great deal of guff about "psychology" in treatises on advertising. We suppose these things are all right in homeopathic doses, but one tires of glistening generalities and longs to get down to two-and-two-make-four, at least occasionally.

For these reasons we are glad to say a commendatory word for Doctor Galloway's book, now in its third printing, for it is a brass tack book. It comprises a thorough manual of business organization and administration, covering office organizations, arrangement and operation, with special consideration of the employment, training and payment of office workers. The business manager, office manager, chief clerk and every department head will find this working guide of unusual value in the planning and control of office systems. The author and his coworkers have inspected many of the best organized offices in the country. This book, which is the result of their investigations, is based on successful fact, and not airy theory. It presents the best methods for handling the routine functions of practically every business department.

For the organizer, the author presents fundamental rules for the analysis of conditions, the standardization of processes, and the control of personnel and production. Wages and bonus systems are covered at length. Comprehensive and practical chapters are devoted to the hiring and developing of office help. In this connection the author presents a full outline of educational courses being used in typical business houses. To acquire this same fund of information independently would cost any concern many hundreds of dollars. The book is well worth the six dollars asked for it.

We have received from the Pangborn Corporation, Hagerstown, Md., a handsomely printed and copiously illustrated pamphlet, sixteen pages and cover, approximately nine by twelve inches, devoted to the dissemination of

general information concerning the "world's largest manufacturers of sand blast and allied equipment." The motto on the cover: "To see is to understand," warrants the presentation almost entirely by half tones, of which there are about 130, beginning with a general view of the works, three dozen portraits of responsible men of the organization, exterior and interior views, etc., and then a miscellaneous presentation of the apparatus manufactured. It is worth sending for.

FOUNDRY PRACTICE, by R. H. Palmer. A text book for molders, students and apprentices. Second edition, partly rewritten, and enlarged. Price, $3 net. 400 pps. 5x9 inches, 220 illustrations. New York: Messrs. John Wiley & Sons.

THE BOOK is true to title. It is a book of the foundry by a practical foundryman and deals closely with foundry apparatus and foundry manipulations, so that it is informing and suggestive for the actual workers in the foundry and also for students and others seeking instruction in these lines. In this second edition various additional matter is to be found adding materially to the practical value of the work. The book has a very satisfactory index.

BUSINESS LAW, A Working Manual of Every-day Law, by Thomas Conyngton, of the New York Bar, with the collaboration of Elizabeth A. Smart, of the New York Bar. Fourth printing. Price, cloth, $4 delivered. New York: The Ronald Press Company.

UNLIKE OTHER law works, this book is really interesting, while there is no question of its legal accuracy. It is intended for the layman unfamiliar with legal phraseology and technique, to help him keep his business on a solid foundation as far as knowledge of the law can prevail. Mr. Conyngton presents the complete law, an absolutely dependable basis of quick, sure decisions where important issues are involved.

The lay business man and the lawyer alike are obliged to dig out general guiding principles for safe and conservative action from a perfect morass of law, for we are really a law-ridden people, what with our multiplicity of national, state and municipal enactments and regulations. The theory of the law is admirable, as the the joint authors of *Business Law* observe; its object is to procure right and justice for all men. In observing the results of its practice, however, who does not know, unfortunately, how far it sometimes falls short of attaining these ends

The reason for such a book as this, therefore, is readily apparent. It is its purpose to explain the conditions and indicate as nearly, and as clearly as may be, how the individual business man may shape his conduct and manage his affairs so as to avoid the more serious legal difficulties. There is an old adage that reads, "By lawsuits no one has become rich," and another one carrying a strong hint, "A good cause and a good tongue, yet money must carry it."

These are of a kind with that other professional pleasantry, "Fond of lawsuits, little wealth; fond of doctors, little health." It is certain, at any rate, that no good lawyer ever goes to law himself. He knows better.

In this book our authors have prepared a manual of everyday law for the man or woman that owns property, does business, and engages in affairs—a book of guiding essentials that may save its possessor much time and expense. Law in its modern manifestations cannot be studied without taking into consideration economics and sociology. The lawyer of a half century ago would be surprised at present-day business complications. The law awards compensation to injured workmen; it compels persons who erect buildings to make them sanitary and to provide modern conveniences; it compels the factory owners to provide appliances for the safety of his employees; it prohibits combinations in restraint of trade. Much of the legislation of the present day consists in the application of these modern principles to the social and industrial life of our country.

For these reasons we believe this Conyngton-Smart book worthy of an important place on every office book shelf, and we heartily commend it to men of business.

F. J. T.

Rix Compressed Air Publications

IN CONNECTION with the development and rapid extension of compressed air practice for the last two or three decades no name deserves more honorable mention than that of E. A. Rix of San Francisco. He has been a constant and effective leader in compressed air ways and means and he has always stood for correct and economical practice. He has been not a mere theorist but eminently practical throughout. He has been an inventor and designer of up-to-date apparatus and as a result there now came to hand three recent publications of the Rix Comtails of design and construction. Then follow hoists of different types, rock drills, drill bits, hose and fittings, oil engines, etc., with several pages of tables and useful information.

Catalog, 150, *Rix Special Air Compressors,* twenty pages and cover, whose contents are sufficiently indicated by the title.

Booklet No. 51, *Rix Free Air Units for Garage Service,* twenty pages 4 by 8½ inches. The variety of rigs here shown suggests the range and magnitude of the demand and the full adaptability of the supply. The following sentence is worthy of special commendation:

"We do not claim our outfits will furnish more air than similar types, but we do claim, considering the bore, stroke, speed of the compressor and horsepower of the motor used, to deliver as much air as any machine made of similar size, and to do it with as little power consumption as any."

Business Books for the Holidays

So wide-spread has become the interest among the business-reading public in business literature that the A. W. Shaw Company, publishers of Shaw Standard Business Books, conducted this year a Christmas and New Year business book campaign. To the ambitious man or woman a business book is one of the most useful gifts of all; certainly one that is most practical and far-reaching in effect. For the vital, helpful information in business books means promotion, savings in time and money, and larger earnings for the reader.

The Shaw people have issued their books in series. For the banker there is a banking series; for the sales manager, a selling series; for the factory manager, a library of factory management; for the young man, a business training series.

The Manufacturers' Club, of Philadelphia, blossomed forth this autumn with Vol. One, No. One of a new monthly club periodical, *The Manufacturer,* of which Mr. Warren F. Doane is the editor. It is of the standard 9x12 size and 38 of its 68 pages are filled with advertising, a most enviable business beginning for a new publication. The first number contained an excellent article, *The Sheep and Wool Industry of the United States,* by Mr. A. C. Bigelow, president of the Philadelphia Wool and Textile Association. Mr. James B. Reynolds, one-time Assistant Secretary of the Treasury, and formerly also a member of the U. S. Tariff Board, contributed an article, *The Responsibility of Labor.* The President of the Philadelphia Bourse, Mr. Emil P. Albrecht, wrote on *The Manufacturer's Interest in Transportation.* We wish the new journal the success it deserves, a goodly measure of which is apparent at its beginning.

New sheet mills being installed by the Mansfield Sheet & Tin Plate Co., Mansfield, O., will be fired with powdered coal. For this work the Quigley air transport coal, together with Quigley powdered coal feed controllers, burners, etc., will be used.

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Notes of Industry

The cost of building an airship of the R-34 type in England is approximately $1,750,000. Cost of housing shed, with extensions and wind screens, is about $800,000. There are required 14 officers and 400 men at the station for handling, berthing, cleaning airships, etc. Estimated total cost of the airship when in commission depends on the distance flown. Taking as a basis 8,000 nautical miles per month at a speed of 40 knots, it amounts to about $13,000 at current rates for cost of petrol, oil and gas. This figure does not include the wages of the crew, and also one-fourth the total of the personnel required for handling, etc., as this latter is adequate for maintaining four airships in commission.

Some Mexican mining companies, operating in the vicinity of Mazatlan, and whose properties are far from any road, are seriously considering the regular adoption of airplanes for the transportation of supplies. It is a curious thing that one of the principal advantages expected is the carrying of heavier pieces of machinery than can be taken over the rough pack-trails that at present furnish the only means of transportation.

The application of pulverized coal to copper blast furnaces has been made successfully. This is a comparatively new application of pulverized coal to industry. The pulverized fuel is introduced into the blast pipes above the tuyeres without disturbing seriously the existing conditions at any modern blast furnace plant.

The Missabe Mountain, Virginia, Minn., one of the largest state-owned mines on the range, broke all shipping records in the last week of October, when 85,000 tons were shipped to the Head of the Lakes, yielding the state school fund $21,500 in royalties. It was the biggest shipment from any of the Minnesota state-owned mines in this or in past years. The property is an open-pit mine and has been a big producer every year.

Employes of the Edgar Smelter in Cherryvale, Kansas, walked out some weeks ago and at the same time presented a demand either for higher wages or for cheaper groceries. The company agreed to make a trial of selling groceries at cost to their employees, who soon went back to work, confident that they would be able to save 50 cents a day at the company store, which was the increase in wages they had requested. Other concerns in Southeastern Kansas are reported to be watching the experiment with interest, most of the companies and their employees having recognized that a mere advance in wages doesn't solve high living costs.

The Alsace potash fields are reputed for having in their bosoms 300,000,000 tons of potash valued at 60,000,000,000 marks. The first deposits were found in 1904 and the relative production, according to *Wirthschafts Dienst* in 1913 was 1,110,370 metric tons in the whole empire. Alsace produced 287,000 tons that year. The Germans have had state regulation in the matter of potash mining and the government apportioned what each mine could produce in order that an equalization could be obtained in fairness to all concerned.

The recent change of name of the British Westinghouse Electric and Manufacturing Company (Limited) is said to presage no change of policy on the part of the company. It is worth noting, however, that from its inception in 1899 until 1917 the then British Westinghouse Electric and Manufacturing Company was controlled by American shareholders, but in the latter year the American holding was taken over by the Metropolitan Carriage Wagon and Finance Company, then afterwards came amalgamation with the Vickers interests. Thus the company—now to be known as the Metropolitan-Vickers Electrical Company—becomes entirely British.

H. C. FRICK, STEEL AND COKE MAGNATE, PASSES ON

HENRY CLAY FRICK, a figure of national prominence in the steel and coke industries of the United States, died early in December. Among the men identified with the development of these great industries, none had a more leading part, especially in coke.

Mr. Frick was born of an impecunious family in the mining regions of Pennsylvania 69 years ago and entered the coke business as a representative in Pittsburgh for Morgan & Co., coke dealers, at the age of 21. He first came into public notice by his vigorous management of the famous Homestead strike in 1892, when he was shot by one of the strikers.

Mr. Frick was associated with Andrew Carnegie in the acquisition of railroad and steamship lines and while mining and foundry companies were being absorbed by the Carnegie Steel Co. He was responsible for the purchase of a large portion of the Mesaba ore properties in the Lake Superior iron district, which placed in possession of the Carnegie company, the largest, richest and most easily worked deposits of iron ore in the United States.

Mr. Frick was afterward active in the affairs of the United States Steel Corporation, particularly so in 1907, when in conjunction with Judge E. H. Gary, he urged President Roosevelt's acquiescence to the taking over of the Tennessee Coal & Iron Co. by the steel corporation. This deal resulted in, it is asserted, the cessation of the serious financial panic of that time, which was threatening national disaster.

Mr. Frick was noted for his generous philanthropic work and as a patron of art. His vast art treasures were of international fame and included rare paintings by many old masters. He left his finest of private collections, valued at $10,000,000, to the City of New York. His fortune was estimated in round figures at $150,000,000.

Buenos Aires

Frank Richards dropped his venerable timepiece on the floor in our editorial sanctum. "There," he said, as he perceived that the works had gone dead, "that's the second time that has happened in the last thirty years."

Quickern a flash the roguish Bunny exclaimed, "Gosh, Mr. Richards, you're getting careless."

Up to press time the Administration had refused to *fall* for the New Mexico senator.

Cap'n "Zip Zip," the skipper of the good U. S. S. *Siam Duffy*, a mine sweeper of the squadron that cleaned up the North Sea barrage of mines, was among those present at the mine sweeper rendezvous in the Hudson River recently and the following tale got around New York about him. It seems that all the craft of the sweeper squadron were named after men of the crew of the *Victory*, the flagship of Admiral Nelson. The *Siam Duffy* was one of these, as was another estimable vessel called the *Thomas Laundry*. Cap'n Zip Zip got a wireless one day on board the *Duffy* to take the *Laundry* into Kirkwall. The skipper didn't quite comprehend the significance of the wireless at first and replied to headquarters: "Where the h—— do I *get* the laundry and whose is it?"

In the official proceedings of the Central Railway Club, New York, for the August, 1919, meeting, there appears this notice on the reverse of the title page in large black letters: "ARE YOUR DUES FOR 1919 PAID? Time limit for Payment Growing SHORTER!" On the page facing this announcement there appear in a deep black mourning border the names of four deceased members, with the dates of their deaths. On seeing this juxtaposition of announcements the incorrigible Bunny wrote above the names of the departed, "THEY WAITED TOO LONG."

After a trip with Editor Will F. Muse of the Mason City (Iowa) *Globe-Gazette* around Puerto Rico back in 1917, we thought him an honest man, but judge of our surprise to read the following credited to his paper:

Seven years ago a farmer living west of Charles City, Ia., hung his vest on a fence in the barnyard. A hungry calf chewed up a pocket of the garment in which was a standard gold watch.

Last week the animal, a staid old milch cow, was butchered for beef and the timepiece was found in such a position between the lungs of the cow that the respiration—the closing in and the filling of the lungs—kept the stem-winder wound up and the watch had lost but four minutes in the seven years.

Our friend, Homer Guck, editor of the Houghton (Mich.) *Daily Mining Gazette*, reported the following recently, the item coming to our notice via *Judge*:

Joe Fountain of Bootjack, Mich., was willing to plead guilty in court to the charge of making liquor, having a private still in his home. Prosecuting Attorney Lucas told the court that he tried to get a promise of reformation from Joe, a promise at least that he would refrain from drinking for the remainder of his life.

"Not me," was Joe's answer. "It might go wet again."

As Joe's infraction included only making a little spirit for his own use he was released on payment of the costs.

RAWMIE INTHEBEAN.

CONFIDENTIAL EMPLOYMENT BUREAU

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HELP WANTED

No. 441—Experienced miners wanted for Northern Peninsula of Michigan on Copper Range. Steady, permanent employment for drillers, etc. Conditions excellent and free insurance benefits. Write to this Bureau at once, giving experience and other particulars.

No. 442—Good miners, two captains, etc., required by a large property in the State of Minas Geraes, Brazil. Good pay. Climate equable and mild. Write advertiser No. 442 for details.

No. 443—Engineer wanted for power plant in Southern Wisconsin. Three Stirling boilers, chain grates, 750 kw. turbine, Corliss engine. Must be experienced and self-reliant.

No. 444—Middle West manufacturer with progressive line and expanding business wishes an able production manager, who must have ginger and ability to handle workmen successfully. Personality will count more than knowledge of the manufacturer's line. Write giving full details about self, engineering experience if any, and what salary is desired.

POSITIONS WANTED

No. 870—A mining engineer, formerly of Petrograd, under the old government regime, and with twenty years' experience in Europe and Asia in coal and other mines, desires a place as mining engineer with a prominent American company. Can provide excellent references.

No. 871—Mining engineer, nine years' experience iron open pit and underground, two degrees, Michigan College of Mines, copper experience British Columbia and Washington, now foreman large open pit, desires place as superintendent or assistant. Wants $5,000. Services now available.

No. 872—Position wanted either as mining superintendent or assistant by experienced man. At present connected with a Lake Superior copper mining company. Full information will be given in first letter. Willing to go to any part of the world. Honor man Michigan College of Mines.

No. 873—Head draftsman with large machinery house, thoroughly capable and having had fine training and wide experience, desires place in the Far West after February 1. Salary, $3,600.

No. 874—Foreman of malleable iron foundry open for place either as foreman or superintendent. Is thoroughly competent and well recommended. Forced out by amalgamation of interests. Single, and will go anywhere.

No. 875—First class pattern maker seeks place in Middle West, preferably vicinity of Chicago.

No. 876—Thoroughly efficient and highly accomplished construction engineer of many years' experience on big jobs, a man who wins loyalty and results from his men, of agreeable but compelling personality, engaged on important government work during war, will soon be open for engagement. A find for a company requiring a high class, able man. Plants, bridges, marine work, reservoirs, foundations, subways, explosives equipment and general construction handled. Will correspond in strict professional confidence regarding any suitable opening.

No. 877—Man thoroughly familiar with pneumatic tool practice, having extensive experience in manufacturing, repairing and assembling, wants position as supervisor of pneumatic tool repairs. At present employed in large plant. Full information and references given in first letter.

No. 878—Responsible man wants place as supervisor of pneumatic tool repairs. Has held similar positions for a number of years in large plants. Can furnish highest grade references.

Latest U. S. Patents

Full printed uncertified copies of specifications and drawings of any patent may be obtained by sending ten cents (not stamps) to the Commissioner of Patents, Washington, D. C.

OCTOBER 28

1,319,696. PERCUSSION-TOOL. Arthur C. Davidson, Brooklyn, N. Y.

1,319,766. WIND-MOTOR. James G. Gracey, St. Louis, Mo.

1,319,775. AIR-PUMP. Paul W. Keating, Ochiltree, Tex.

1,319,783. COMPRESSED-AIR SHOCK-ABSORBER. Edgar E. Merrill, Denver, Colo.

1,319,792. HOLDER FOR PNEUMATIC HAMMERS. Peter Rudeli Gray Thorson, Sunderland, England.

1,319,797. AIR-LIFT APPARATUS. Edwin M. Rogers, New York, N. Y.

1,319,861. COOLING AND FLOW-EQUALIZING MANIFOLD FOR COMPRESSORS. Mario Ballotra, Turin, Italy.

1,319,869. APPARATUS FOR USE IN MOLDING. Eugene L. Howe, Muskegon, Mich.

1,319,898. LIQUID-SOAP DISPENSER. Chas. E. Post and Paul G. Wagner, Los Angeles, Calif.

1,319,951. GROUND-BREAKING DEVICE. David Erter, Springfield, Ohio.

1,319,968. ROCK-DRILLING APPARATUS. Sten Rudberg, Stockholm, Sweden.

1,319,975. DRILLING APPARATUS. William A. Smith, Denver, Colo.

1,319,978. DEHYDRATING APPARATUS. Clarence R. Taylor, Fort Worth, Tex.

1,320,079. PNEUMATIC STRAW-STACKER. Wallace F. MacGregor, Racine, Wis.

1,320,167. PROCESS OF SEPARATING AQUEOUS AND OTHER VAPORS FROM AIR AND GASES. Auguste Jean Paris, Jr., Bradford, Pa.

1,320,168. METHOD OF PRODUCING LOW TEMPERATURES. Auguste Jean Paris, Jr., Bradford, Pa.

1,320,224. SUCTION-PRODUCING APPARATUS. George W. Garman, Philadelphia, Pa.

1,320,367. PLANT FOR FEEDING PULVERIZED COAL TO FURNACES. Joseph E. Kennedy, New York, N. Y.

NOVEMBER 4

1,320,374. LIQUID-FUEL BURNER. Samuel Barton Brown, Los Angeles, Calif.

1,320,485. SYSTEM OF OPERATING VEHICLES BY FLUID-PRESSURE. Robert Maw and William B. McLean, Montreal, Quebec, Canada.

1,320,703. JOURNAL-BEARING AND COMPRESSOR PROVIDED THEREWITH. Benjamin S. McClellan, Chicago, Ill.

1,320,724. APPARATUS FOR GENERATING AND DIFFUSING WATER-VAPOR INTO THE ATMOSPHERE OF ROOMS. Jonathan Wright and William H. Marshall, Pleasantville, N. Y.

1,320,792. ROTARY AIR-COMPRESSOR. Juan Noguera and Jesus Doval, Buenos Aires, Argentina.

1,320,874. VACUUM-PUMP. Irving Langmuir, Schenectady, N. Y.

1,320,879. AUTOMATIC PRESSURE-REGULATOR. Frederick A. Litter, Columbus, Ohio.

1,321,060. SUNKEN-VESSEL-FLOATING APPARATUS OR SALVAGE APPARATUS. Rekizo Kunisawa, Tokoro Gun, Hokkaido, Japan.

NOVEMBER 11

1,321,150. CONTROLLING-VALVE FOR VACUUM-OPERATED POWER MEANS. Howard C. Root, Indianapolis, Ind.

1,321,209. AIR-PUMP. Enoch P. Hultin, Elkhart, Ind.

1,321,262. FUEL-FEEDER FOR PULVERIZED FUEL. Joseph F. Townsend, Canton, Ohio.

1,321,296. VACUUM FUEL-FEED DEVICE. William A. Edwards, Chicago, Ill.

1,321,301. PNEUMATIC CUSHION. Willis A. Gibbons, Flushing, N. Y.

1,321,302. UNDERWATER-MINING MACHINE. Frank L. Gilman and Willis M. Baum, Los Angeles, Calif.

1,321,340. AIR-COMPRESSOR. Harvey F. Stoke, Roanoke, Va.

1,321,372. MILKING-MACHINE PULSATOR. John L. Hulbert, Poughkeepsie, N. Y.

1,321,756. FUEL-SUPPLY APPARATUS FOR INTERNAL-COMBUSTION ENGINES. Chas. F. L. King, Edgbaston, Birmingham, England.

1,321,764. ROTARY AIR-COMPRESSOR. Andrew Loken, Harvey, N. D.

NOVEMBER 18

1,321,920. AIR-COMPRESSOR. Orville E. Houser, Chillicothe, Ohio.

1,321,923. REFRIGERATING-COMPRESSOR. George F. Knox, Milwaukee, Wis.

1,321,983. PNEUMATIC SHOVEL. William Cole, Ironwood, Mich.

1,321,996. INJECTOR. Henry A. Dreffein, Chicago, Ill.

1,321,999. TREATMENT OF LIQUIDS. William S. Elliott, Pittsburgh, Pa.

7. The method of treating liquids for the removal of air and other contained gases and also for the removal of scale-forming elements contained therein, which consists in introducing the liquid into a chamber in heated condition, and maintaining a sufficient vacuum in said chamber to cause a violent ebullition or flashing of the liquid as it enters said chamber under the action of the heat contained in the liquid, whereby the air and contained gases are liberated and scale-forming elements are precipitated, substantially as described.

1,322,021. SHOCK-ABSORBER FOR MOTOR-VEHICLES. Charles D. Jenney, Indianapolis, Ind.

1,322,026. APPARATUS FOR PRODUCING CYANIDS FROM NITROGEN OR AIR. Herman B. Kipper, Muskegon, Mich.

1,322,107. AIR-DRIVEN IMPLEMENT. Albert Carlos Gressle and Ralph E. Asbury, Hamilton, Ohio.

1,322,196. TIRE-INFLATING AND PRESSURE-INDICATING DEVICE. Orlando H. Meyers, Dudley, Ill.

1,322,230. AIR-RECUPERATOR APPARATUS FOR STORING PART OF THE RECOIL ENERGY OF ORDNANCE. Arthur Trevor Dawson, Westminster, London, and James Horne, Barrow-in-Furness, England.

1,322,273. AIR-PUMP. Robert Warnock, Bloomfield, N. J.

1,322,277. COMPRESSOR. Torris H. Alfreds, Chicago, Ill.

1,322,305. AIR-LIFT-PUMP CONTROL. David K. Hutchcraft, Indianapolis, Ind.

1,322,361. VACUUM SEPARATING APPARATUS. Israel S. Sherman, Brooklyn, N. Y.

1,322,363. ROTARY BLOWER OR PUMP. Otto Siemen, Nonnendamm, near Berlin, and Werner Siecke, Berlin, Germany.

1,322,377. AIR-BRAKE SYSTEM FOR MOTOR-CARS. Walter H. Utterbaugh, Columbus, Ohio.

1,322,418. RAILWAY-TRAIN CONTROL. Howard S. Folker, San Francisco, Calif.

1,322,483. PUMP. George E. Denman, Fruitvale, Calif.

The Iowa Section of the American Water Works Association elected the following officers at the autumn meeting: Chairman, G. B. Shoemaker; vice-chairman, F. D. H. Lawlor; directors, R. B. Wallace and F. B. Ross. The parent association will be petitioned for the extension of territory to include Nebraska, South Dakota and adjoining states not having sections. The next meeting will be in Iowa City. Jack J. Hinman, Jr., is secretary.

On April 13, 1869, one Thomas Kerr, an office boy in the employ of a patent attorney in Pittsburgh, witnessed by his signature the application of George Westinghouse for the first patent rights on the original Westinghouse airbrake. One evening this autumn, at the William Penn Hotel in that city, Mr. Kerr was the first speaker to address Westinghouse men at the golden anniversary jubilee dinner of the Westinghouse Airbrake Company as the general patent solicitor of the company. He spoke on "The Fundamental Patent, Number 88929."

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